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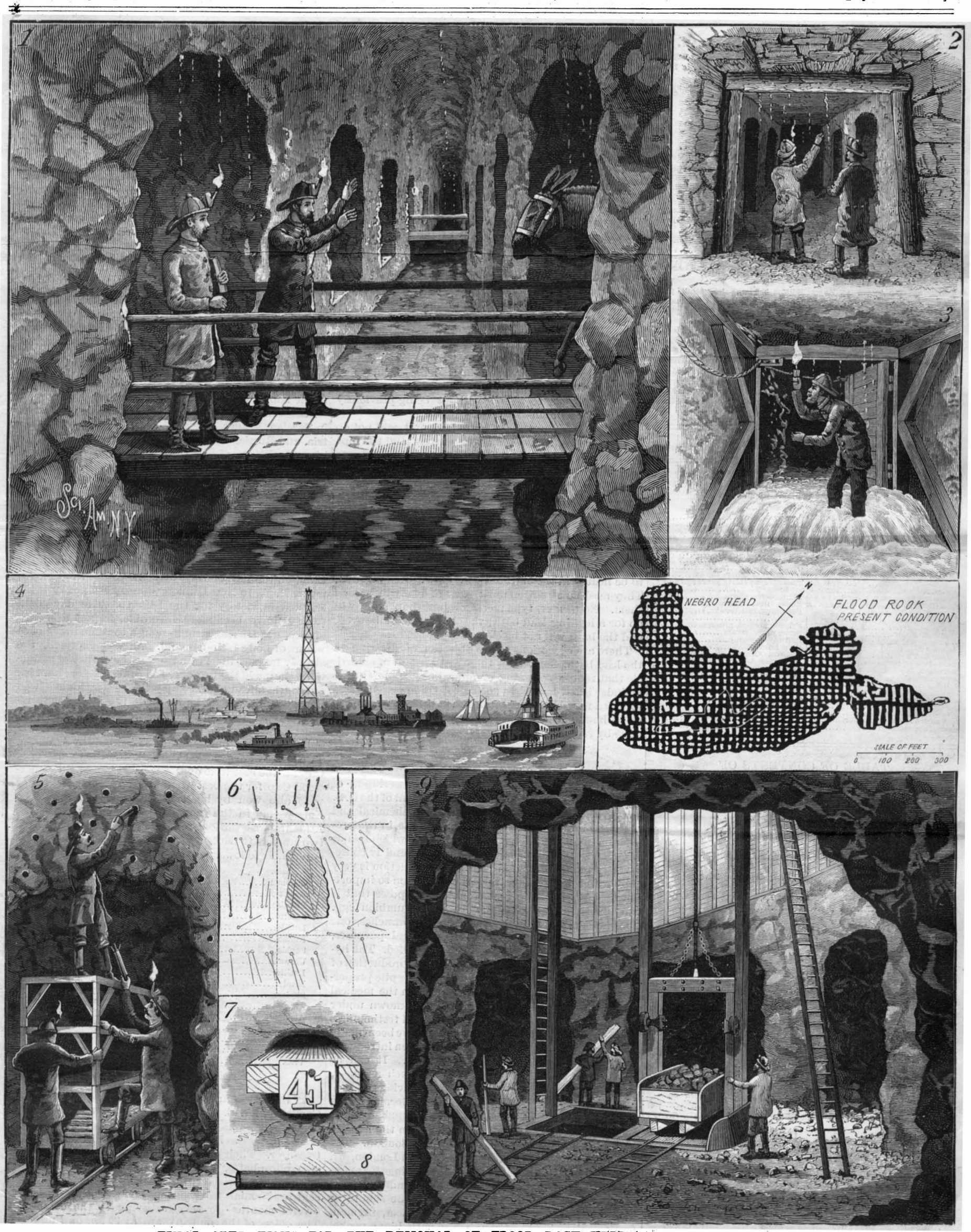

FINAL OPERATIONS FOR THE REMOVAL OF FLOOD ROCK HELL GATE N. Y..—[See page 53.]

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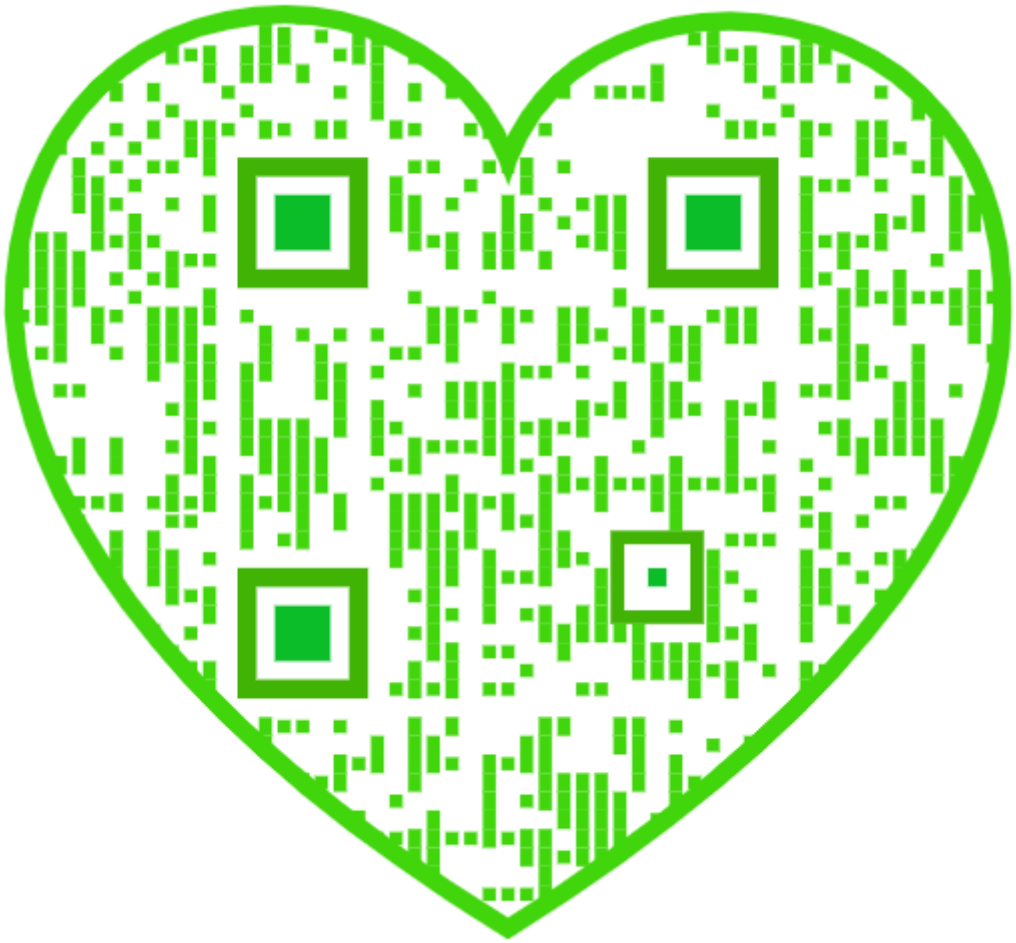

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THE LEAD BATH.

Melted lead for heating steel articles to be hardened has become quite common in shop use. There was a time when it was employed only for articles of varying thickness, so that the part to be hardened could be heated; while that to be left annealed need not be greatly warmed; but it has been proved that a more even heat can be obtained on articles of even size, as well as on those of varying dimensions, by the lead bath, and that the heating can also be done quicker than over a charcoal fire. There is another advantage in the lead bath heating, one of great convenience at times, and that is that the article to be heated may be kept an indefinite time in the hot lead without being burned; it will not get beyond the proper heat for hardening.

There is an improper use of the lead bath in the attempt to employ it for drawing to temper; the bath will do its absolute will, and as evenly and indiscriminately reduce the hardness as it heated the steel. This uniform drawing is not always desirable; there are tools and other pieces that require careful management and much humoring to bring them to their proper degrees of temper. This cannot be done in the evenly heating lead bath; the proper drawing is either over a clean charcoal fire or in a bath of heated sand. Whenever the last can be used, it is preferable on all accounts.

Of course, such drawing must be done to color, and this is one of the advantages of the lead bath for heating for hardening; the steel does not contract an oxide so thick or so discolored that the steel itself may not be seen. In heating for hardening in a fire the surface of the steel is burned, so that it contracts a coating that must be removed by direct abrasion, before the true surface of the steel can be seen. But in lead heating the lead appears to be a defense against the oxygen of the air, and the steel comes out clean. The writer has made tests that prove that the surface of machine polished steel coming from the lead bath, and being chilled in a pickle or in water, will show every gradation of color as to temper without being previously scoured or brightened.

The lead bath must be of pure lead. It will not do to use the sheet lead of old eaves, gutters, and the pipe of old drains from sinks, eaten half through with atmospheric acids and the worst corrosives of the kitchen; the lead must be chemically pure. Buy lead in pigs from the mines—the Galena brand is reliable—or buy the somewhat higher priced bar lead. Both are as nearly absolutely pure as is possible. Melt in a plumbago crucible or an iron pot. Heat the lead to a cherry red and keep it so. Cover the surface with charcoal dust. Suspend or immerse the articles to be heated in the bath until they are heated through, They need no attention until you are ready to harden them. No pewter, type metal, or junkshop stuff will do for a heating lead bath; the heat cannot be even, and the bath will not be clean.

There are exceptions to the objection of drawing in the lead bath. Sometimes there are portions of an article that require softening or annealing, while the remainder is left hard. In such a case the portion to be softened may be immersed in the bath and be annealed without affecting the other portions, as would be done by radiant heat.

A New Swedish Invention.

The Swedish civil engineer A. F. Westerlund, of Stockholm, has lately obtained letters patent of the U. S. for a very useful invention within the chemical and technical branches of science. It consists in the production of an almost incombustible coal, which stands between the graphite and the diamond, and is consequently named diamond coal. Its production is very simple and inexpensive, and the invention so important for both hygienic and technical purposes that it can almost be looked upon as the Columbian egg. This invention can be divided into two branches, one for hygienic and the other for technical purposes, which latter have not yet been fully compiled. The hygienic part is based principally upon the production of a coal in felt form, which through its antiseptic properties has created quite a sensation within the medical fraternity, both here and abroad. It is known under the name of carbon wadding. The highest testimonials of the first military surgeons of Sweden have been gladly given to the carbon wadding, and it has been introduced into the principal hospitals in London. It can be made from any vegetable substance, such as moss, hay, straw, cotton, paper, cork, wood shavings, etc.

Prof. Esmark, Surgeon-General of Germany, has given the invention the very best recommendations, and the carbon wadding is now in use in the English navy. A large shipment has gone to the Soudan. The Samaritan Society's most active member in London, Mr. Macleer, considers it one of the best dressings for external injuries, to be applied as the first bandage in any case of necessity, and says that no home should be without it. Every conductor, police officer, fireman, and traveler should always carry with him a pocket bandage, which is always ready for use, and does not occupy more room in the pocket than a small cigar case. In the United States the carbon wadding has met with favorable results, considering the short time it has been here. Prof. Lewis A. Sayre, Dr. Pihlgren, Dr. Hazelton, Dr Phelps, Dr. Theel, and others speak of it in the highest terms. For disinfectant purposes the diamond coal is said to stand alone, unrivaled.

It would be impossible in a small space to state all the particular advantages of this invention for technical purposes, but we shall mention a few of the principal ones. It is one of the best insulators for cold or heat, and has as such caused considerable attention both in Europe and here. For steam packings it is said to be without a rival, because it is an excellent non-conductor of heat, and is very light. It is stated to be the best filling for safes, refrigerators, etc., and for this purpose only it may be considered of inestimable value. For producing fireproof roof coverings, mortar, painting woodwork, railroad bridges, etc., to prevent them from destruction by fire or rot, the diamond coal has a very promising field.

Extensive experiments have been made with the diamond coal in the electrical field, and it has shown even here its real value, and promises, so we are told, to be the best material for the carbons in the electric light. Other uses for this invention are in the manufacture of dynamite and gunpowder, for, by a very simple chemical process, it can be completely converted into charcoal of the purest quality. Several other uses can be made of this coal, and it is alleged that Mr. Westerlund, by his invention, has given the world a new material, which will most forcibly make its headway into the different branches of industrial interests.

This invention has been shown and recommended by the principal chemists and physiologists, and such eminent men as Professor A. E. Nordenskiold, Professor Erick Edlund, of the Academy of Sciences, etc., Professor V. Eggerts, of the College for the Sciences of Mining, etc., Professor E. M. Edholm, Chief Surgeon of the Swedish Army and Physician in Ordinary to the King, etc., Surgeon-Major H. W. Hulphers, Physician to the King, and many others.

Patents have been obtained, besides the United States, in Sweden, France, England, Germany, Belgium, Austria, and Russia. Engineer Westerlund has associated himself with one of Stockholm's most prominent firms, Elfwing & Co., and one of the principals of this well known house, Mr. C. M. Ohrnell, is now here in New York, where he has opened an exhibition of this new invention at Cooper Institute, room 25.

Remarkable Race of Steam Yachts.

The second annual regatta of the American Yacht Club, on the 16th of July, over the course from Larchmont, N. Y., to New London, Conn., distance 92 miles, resulted in victory for the Stiletto. The day could scarcely have been more favorable, for not a breath of wind was stirring strong enough to ruffle the smooth waters of Long Island Sound. As was expected, the already famous little Stiletto was the center of attraction: she made the run over the course in 4h. 49m. 54s., coming in ahead of all competitors. Mr. Gould's well known yacht, the Atalanta, made the second best record, having taken but four minutes more than the Stiletto. Cramp's new yacht, No. 246, also did remarkably well, being only 13 minutes behind the Atalanta. Two prizes were awarded the Stiletto—the Commodore Cup for the best time over the course, and the Isherwood Cup for the best time in her class. Other cups were also won by boats in different classes. The Emery Cup in the first class was not won, as the Atalanta was the only eligible boat, and it required two starters to make a race. Seventeen steamers were entered, as follows:

Name.	Draught.	Owner.
Lagonda	118 ft.	J. C. Hoagland.
Radha	135 ft.	J. M. Seymour.
Promise	90 ft.	A. De Cordova.
Stiletto	91 ft.	John B. Herreshoff.
Lucille	63 ft. 9 in.	John B. Herreshoff.
Norma	131 ft.	Norman L. Munro.
Sophia	100 ft. 1 in.	C. H. Osgood.
Utowana	122 ft.	W. E. Connor.
Lucille	88 ft. 3 in	Jas. N. Waterbury.
Rival	87 ft. 8 in	J. A. Baker.
Skylark	74 ft. 3 in.	A. E. Bateman.
Aida	90 ft.	W. P. Douglas.
Atalanta	228 ft.	Jay Gould
Sphinx	52 ft.	Cyrus W. Field, Jr.
Cramp's	148 ft.	Cramp & Co.
Hornet	87 ft.	F. A. Mitchell.
Viola	52 ft. 9 in.	J. P. Kennedy.

AT the last annual meeting of the Sturtevant Mill Company, Mr. E. C. Huxley, of Boston, was elected president, and has assumed the general management of the business. Mr. T. L. Sturtevant was re-elected treasurer. Their machines for crushing and grinding ores, phosphates, etc., are the first ever constructed where the material crushes and grinds itself, and recent testimonials from various parties using them for several months are very gratifying to the company. The offices of the company are at 89 Mason Building, Boston.

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Carriage by Electric Wire.

This is a wire line for carrying freight or passengers by electricity through the air. The wires or cables in double line, and about eight feet above the other, are corne upon stout posts about the same as the electric light cables are, and the cars or crates for carrying passengers or freight are suspended from the upper cable and supported or borne upon and guided by the under cable as if it was a rail. The lines are adapted to loads of a few hundred pounds each up to a ton weight, including the car, and, as in the case first mentioned, the cars are designed to be sent with great frequency and in any desired number. The driving power is electricity, supplied by steam engines and dynamos at the termini of the line, the carrying cables serving as conductors, just as telegraph wires or cables do, the current being passed by means of the car wheel axles and intervening wires through an electrical motor, which operates under or at the side of the car and travels along with it. We have seen a model of this in operation, the model being large enough to carry a load of about one hundredweight over a line of about one hundred feet in length. The electrical motor used to work this model was an Edgerton of the size employed to drive a sewing machine. So far as smooth movement and speed are concerned, and to all other appearance, the device works in a satisfactory way; but in this as in all other matters of the kind, as the readers of the *Ledger* have been frequently advised, no safe judgment can be made until the machine has been in actual operation for a fair length of time, doing its work day in and day out.—*Phila. Ledger.*

Climatology of the Puget Sound Country.

The inland waters of Washington Territory, Puget Sound, and its tributaries are frequently called the Mediterranean of the Pacific Coast, and justly so, for they are equally exempt from equinoctial storms. Since the Weather Bureau was established on this coast, the highest wind has reached a speed of only about forty miles an hour. During an observation of thirty-one years, the lowest temperature ever recorded was 10° above zero. The highest for the same length of time was below 90°. But in the interior and nearer the mountains, even but a little above the sea level, there are greater extremes of heat and cold.

On this northwestern coast there are no extremes of cold in winter or of heat in summer.

The "Kurosewo" are Japanese currents that set over to the northeast from Japan as they pass to the south of the Aleutian Islands, and strike the coast of Alaska about 60° north latitude, are deflected, or turned to the south-southeast along the coast of Alaska, British Columbia, the United States, and Southern California, to Cape St. Lucas in latitude 22° N. This body of water has a current along the coast of one mile an hour. It is nearly five hundred miles off the coast and nearly one thousand fathoms deep. The year round this body of water is one-half a degree warmer off the coast of Sitka, Alaska, 57° N., than it is off the coast of Cape St. Lucas, which is 22° N.

This body of water all along this coast has a temperature of 55°, and does not vary from these figures more than 3° the year round; but increases some 10° as it passes to the westward.

Now, this body of water has lost one-half of one degree in traversing three thousand miles to the south—quite one-half the distance from the North Pole to the equator. Probably the true cause of our mild winters is this vast body of water giving up its specific heat, and the aqueous vapor of the atmosphere giving up its latent heat by condensation, and *vice versa* for the summer months.

From Oct. 15 to April 15 the prevailing winds of this northern coast are southerly, bringing air from a warm, tropical climate into a colder one, making the rainfall, as you go north, about one and a half inches more to every degree of latitude. This southerly wind causing rain, and a damp atmosphere, and together with the warm current of water flowing along the coast, may be another cause for our mild winters.

From April 15 to Oct. 15 the prevailing air currents are from north to northwest. The atmosphere has given up its moisture by condensation in a cold climate. On its passage to the south it is dry and constantly picking up or restoring the aqueous vapor and heat as it moves toward the south. The dryness of the atmosphere is the probable cause of our cool nights during the summer months, which in Seattle, for example (about 47° north latitude), never varies much from 60° Fahr. at night, when at midday the thermometer has run up to 84°. A fall of 24° in two or three hours is not uncommon.

Prof. Tyndall relates an instance in one of his ascents of Mt. Blanc where the heat of the sun was oppressive while traveling over snow and ice, and by getting under the shelving bench of rocks the cold was severe. This he attributed to the dryness of the atmosphere at this altitude. He also says: "If it were not for latent heat that is stored up in the aqueous vapor of our atmosphere, a single night would leave us in a frigid zone that would freeze vegetation from the face of the earth."

This phenomenon frequently presents itself here. The cirrus or upper clouds will be moving from the north to the south, when the cumulus are moving in an opposite direction. This shows that the summer winds are much more local, or are land breezes.

Another feature of the winters on this coast is the "Chinook," or hot wind, which is a brisk breeze of thirty or more miles an hour. It will cut and melt eighteen inches of snow from the earth's surface probably quicker than a tropical sun.

It is not uncommon along the coast of California and Southern Oregon for three inches of water to precipitate in twenty-four hours, and this with a driving south wind. The large amount of latent heat that is stored up in the aqueous vapors becomes specific by condensation in the warm or "Chinook" winds.

These copious rains of California are a thousand miles south from Seattle, but the "Chinook" winds reach us unaccompanied by rain in twenty-four hours. In these "Chinook" winds the cumulus or lower clouds are passing very high in our atmosphere. Probably a large amount of the snow is wafted by these winds to British Columbia and Alaska, to be again precipitated in copious rains in the vicinity of our last named neighbors. These winds are not of a local nature; they extend over a vast area of the northwest on both sides of the Cascade Mountains, over Oregon, Idaho, Washington Territory, and British Columbia. Their temperature in the vicinity of Seattle is nearly 70°.

CONSTANT READER.

Iron as Fire Resisting.

Some interesting and instructive experiments have been lately undertaken by Professor Bauschinger, of Munich, in reference to the safety of cast iron columns when exposed to the action of great heat. The Professor, having arranged some cast and wrought iron columns heavily weighted, exactly as they would be if supporting a building, had them gradually heated, first to three hundred degrees, next to six hundred degrees, and finally to red heat; then suddenly cooled them by a jet of water, just as might happen when water is applied to extinguish a fire. The experiments showed that the cast iron columns, although they were bent by the red heat, and exhibited transverse cracks when the cold water was applied, yet they supported the weight resting on them; while the wrought iron columns were bent before arriving at the state of red heat, and were afterward so much distorted by the water, that restraightening of them was out of the question. In fact, if supporting a real building, they would have utterly collapsed under the weight they had to sustain. The Professor therefore concludes, as the result of his experiments, that cast iron columns, notwithstanding cracks and bends, would continue to support the weights imposed upon them; while wrought iron columns would not. In experimenting on pillars of stone, brick, and cement concrete, the last was found to be the best. Cement concrete pillars withstood the fierce action of the fire for periods varying from one to three hours; brick pillars, as well as those of clinkers set in cement mortar, displayed great resistance; while natural stone—granite, limestone, and sandstone—were not fireproof. It would therefore appear that, of the several materials for pillars supporting weights, the best for fire resisting purposes were the cast iron and cement concrete.

Crazy Quilt Architecture.

The following from the pen of Bill Nye, in the Chattanooga *Times*, *The American Architect and Building News* thinks, contains more truth than fiction:

It may be premature, perhaps, but I desire to suggest to any one who may be contemplating the erection of a summer residence for me, as a slight testimonial of his high regard for my sterling worth and symmetrical escutcheon—a testimonial more suggestive of earnest admiration and warm personal friendship than of great intrinsic value, etc.—that I hope he will not construct it on the modern plan of mental hallucination and morbid delirium tremens peculiar to recent architecture.

Of course a man ought not to look a gift house in the gable end, but if my friends don't know me any better than to build me a summer house, and throw in odd windows that nobody else wanted, and then daub it up with colors they have bought at auction, and applied to the house after dark with a shotgun, I think it is time that we had a better understanding.

Such a structure does not come within either of the three classes of Renaissance. It is neither Florentine, Roman, nor Venetian. Any man can originate a style of architecture if he will drink the right kind of whisky long enough, and then describe his feelings to an amanuensis. Imagine the sensation that one of these modern, sawed-off cottages would create a hundred years from now, if it should survive. But that is impossible. The only cheering feature of the whole matter is that these creatures of a disordered imagination must soon pass away, and the bright sunlight of hard horse-sense shine in through the shattered dormers and gables of gnawed off architecture of the average summer resort. A friend of mine, a few days ago, showed me his new house with much pride. He ask me what I thought of it. I told him I liked it first rate. Then I went home and wept all night. It was my first falsehood.

The house taken as a whole looked to me like a skating rink that had started out to make money, and then suddenly changed its mind, and resolved to become a tannery. Then ten feet higher it had lost all self-respect, and blossomed into a full-blown "drunk and disorderly," surmounted by the smoke stack of a foundry, and with the bright future of thirty days ahead with the chain gang. That's the way it looked to me.

The roofs were made of little odds and ends of misfit rafters and distorted shingles that somebody had purchased at sheriff's sale, and the rooms and stairs were giddy in the extreme. I went in and rambled around among the cross-eyed staircases and other nightmares till reason tottered on her throne. Then I came out and stood on the architectural wart called the side porch, to get fresh air. This porch was painted a dull red, and it had wooden rosettes at the corners that looked like a brand new carbuncle on the nose of a social wreck. Farther up on the demoralized lumber pile I saw now and then places where the workman's mind had wandered, and he had nailed on his clapboards wrong side up, and then painted them with the Paris green that he had intended to use on something else. It was an odd-looking structure indeed. If my friend got all the materials for nothing from people who had fragments of paint and lumber left over after they failed, and then if the workmen constructed it nights for mental relaxation and intellectual repose, without charge, of course the scheme was a financial success, but architecturally the house is a gross violation of the statutes in such cases made and provided, and against the peace and dignity of the State.

There is a look of extreme poverty about the structure which a man might struggle for years to acquire and then fail. No one could look upon it without feeling a heartache for the man who built that house, and probably struggled on year after year, building a little of it at a time as he could steal the lumber, getting a new workman each year, building a knob here and a protuberance there, putting in a three cornered window at one point and a yellow tile or a wad of broken glass or other debris at another, patiently filling in around the ranch with any old rubbish that other people had got through with, and painting it as he went along, taking what was left in the bottom of the pot after his neighbors had painted their bob sleds or their tree boxes—little favors thankfully received—and then surmounting the whole pile with a potpourri of roof, a grand farewell incubus of bumps and hollows for the rain to wander through and seek out the different cells where the lunatics live who inhabit it.

I did tell my friend of one thing that I thought would improve the looks of his house. He asked me eagerly what it could be. I said it would take a man of great courage to do it for him. He said he didn't care for that. He would do it himself. If it only needed one thing, he would never rest until he had it, whatever that might be. Then I told him that if he had a friend—one that he could trust—who would steal in there some night when the family were away, and scratch a match on the leg of his breeches, or on the breeches of any other gentleman that was present, and hold it where it would ignite the alleged house, and then remain to see that the fire department did not meddle with it, he would confer a great favor on one who would cheerfully retaliate in kind at call.

Motive Power for Tricycles.

Several attempts have been made to utilize electrical energy through the medium of secondary batteries for propelling tricycles and light vehicles, but so far we have not seen anything beyond the experimental stage. Many inventors have also striven, with more or less success, to produce a mechanical motor depending for its movement upon the explosion of a gaseous mixture composed of petroleum and compressed air. The most practical of these is, we think, that of Mr. Eteve, which was introduced last year into this country, but of which we now hear nothing. This principle, says the *Electrical Review*, has been applied to the propulsion of tricycles, and such a vehicle may be seen in the Inventions Exhibition. It is stated that by the consumption of from three to five pints of common petroleum oil per hour, in the "velocycle," as it is called, sufficient power is generated to give to the vehicle with its rider a speed of from 10 to 15 miles per hour. The generator contains a supply of petroleum, enough for a run of three or four hours, from which is evolved, by the aid of two small compressing pumps, the gaseous mixture for consumption in the two engines, in combination with the compressing pumps affixed to the frame of the vehicle in front of the driving wheels and seat. The ignition necessary for the expansion of the gaseous mixture is effected by means of sparks from a tiny electric machine, as in the Eteve engine, at the early part of the outgoing strokes of the pistons in connection with cranks on driving wheels shaft.

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LIPPMANN'S APPARATUS FOR ELECTRIC MEASUREMENTS.

Measurement of the intensity of electric currents is daily becoming an affair of more and more importance. Although there exists a large number of apparatus designed for this purpose, very few of them present all the qualities that are required for their practical employment. Most of these apparatus are based upon purely galvanometric actions. The type of the genus is the well known apparatus of Marcel Deprez, in which a soft iron needle is placed in the intense magnetic field formed by the two branches of a U-shaped magnet. The current to be measured traverses a bobbin and de-

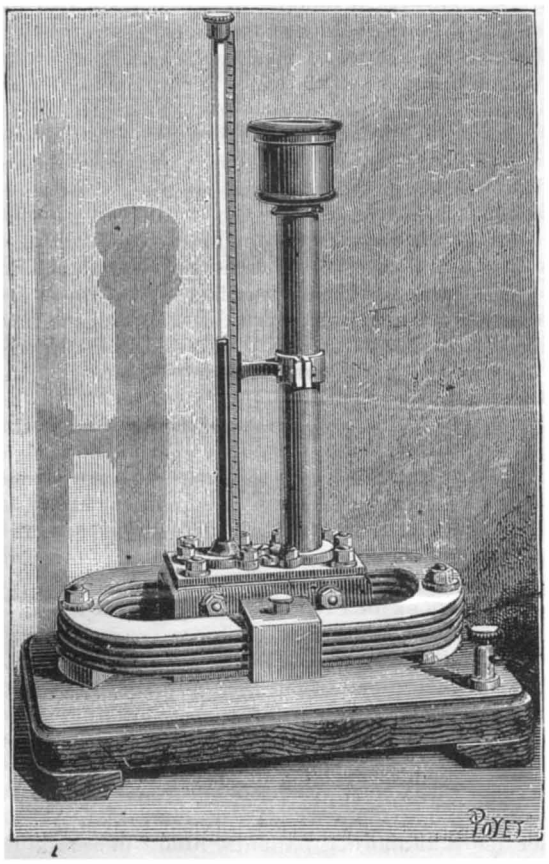


Fig. 1.—LIPPMANN'S AMPEREMETER.

velops a magnetic field whose lines of force are directed at right angles with those of the magnet.

Under the action of these two fields the needle assumes an intermediate position that depends upon the intensity of the magnet's magnetization and the form of its polar pieces, upon the form and dimensions of the needle, upon the form, dimensions, and number of coils of the bobbins, and upon the intensity of the current.

There is, then, *a priori*, no simple relation between the deflections and the corresponding intensities, and it is only by artifices of construction that we succeed in obtaining a perceptible proportionality between these upon a certain fraction of the scale. In reality, each apparatus requires a particular graduation and a determination of a certain number of points, whence are deduced the rest through interpolation.

Lippmann's galvanometers, or amperemeters, present the peculiarity that their indications are indefinitely proportional on the entire length of the scale, and that it is only necessary to know the indication furnished by a given intensity in order to at once deduce therefrom all the rest.

The new principle applied by Mr. Lippmann in his apparatus consists in balancing the electro-magnetic action of the current to be measured by a hydrostatic stress which, at every instant, is proportional to the intensity of the current. It suffices to know one in order to at once know the other.

Fig. 1 gives a general view of Mr. Lippmann's amperemeter, and Figs. 2 and 3 are sections that will permit its principle and mode of operating to be understood.

A mercurial pressure gauge, A B C (Fig. 2), is placed between the branches of a permanent magnet in such a way that the two poles are on each side of the horizontal leg of the gauge. Pieces of iron, with ends in the form of truncated cones, serve as armatures to the magnets, and permit of concentrating the field at B, so as to render it as intense as possible at this point.

The current to be measured is led to the mercury from the horizontal leg of the gauge, and traverses it vertically. It comes in through the strip of platinum, D, and makes its exit through the second strip, E.

That portion of the mercurial column which is traversed by the current represents a movable current element, which, placed in the magnetic field constituted by the magnets, K, tends to move toward the right or the left. The stress exerted upon this current element is proportional to its intensity, and it therefore produces a hydrostatic action, which exhibits itself in a change of level of the mercury, which latter rises in one of the legs of the gauge until the hydrostatic pressure balances the electro-magnetic stress.

The theory of the apparatus shows that its sensitiveness is proportional to the intensity of the field, and inversely proportional to the thickness of the column of mercury. It is in order to obtain great sensitiveness that the chamber, B, is very thin and that the field is concentrated at this point by polar appendages of conical form.

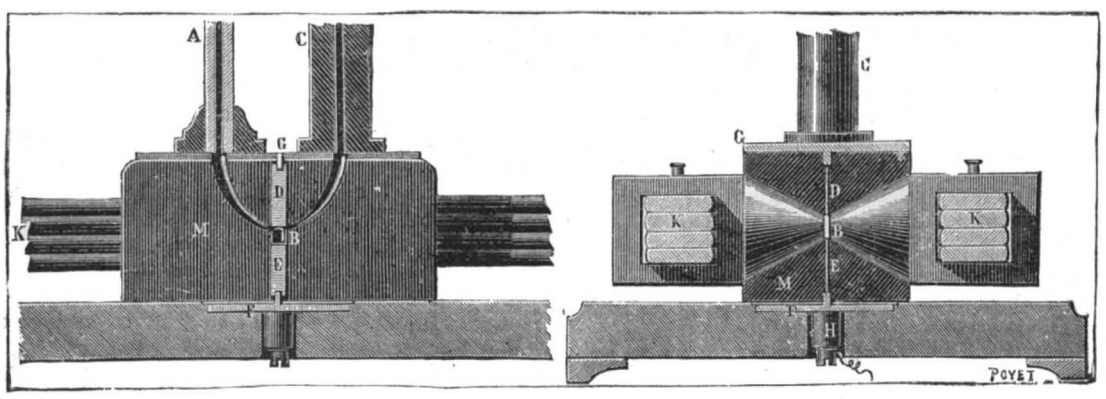
In order that the reading of differences in level may be dispensed with, there is arranged upon one of the legs a reservoir of wide surface in such a way that the level in this leg shall remain constant, whatever be the change in the other leg, which is of glass of small section. The constant level leg is given a certain height in order that all the readings may be made, whatever be the direction of the current. In practice, it is convenient to so arrange the magnets that a current ascending in the horizontal leg of the gauge shall produce an ascent of the mercury in the glass leg, and a descending current produce a depression of the mercury's level.

When still greater sensitiveness is desired, it suffices to incline the glass tube slightly, when a slight change of level will produce considerable of a movement in the column of mercury. Mr. Lippmann's amperemeter is aperiodic, in that it reaches its position of equilibrium slowly, and stops there without going beyond it. And it is reversible, too; that is to say, if the mercury be set in motion by means of an external mechanical force, and the two strips, D and E, be united by a circuit, the latter will be traversed by a continuous circuit that will last as long as the flow of the mercury does.

It is a true unipolar machine, that might perhaps some day be applied either as a mechanical generator of electricity, which should give little electro-motive force, but considerable intensity, on account of its feeble internal resistance, or as a standard of constant electro-motive force, in assuring of a constant flow, and a constant magnetic field that the unipolar machine would itself produce.

The principle of this apparatus has been applied by its inventor to several other apparatus, and, in particular, to an electro-dynamometer and a wattmeter, which figured at the Exhibition of Electricity at the Observatory last March, in the interesting collection of measures presented by Breguet. In the electro-dynamometer, a bobbin traversed by the current to be measured is substituted for the permanent magnet. Under such circumstances the magnetic field is no longer constant, but is proportional to the intensity. The result is that the changes of level in the mercury are proportional to the square of the intensity.

In the wattmeter a long, very fine-wired, and resistant bobbin is substituted for the coarse wire one, and is placed between those two points of the circuit at which it is desired to measure the expenditure of electric energy, while the mercury is, as usual, placed in the total circuit traversed by the current of intensity,



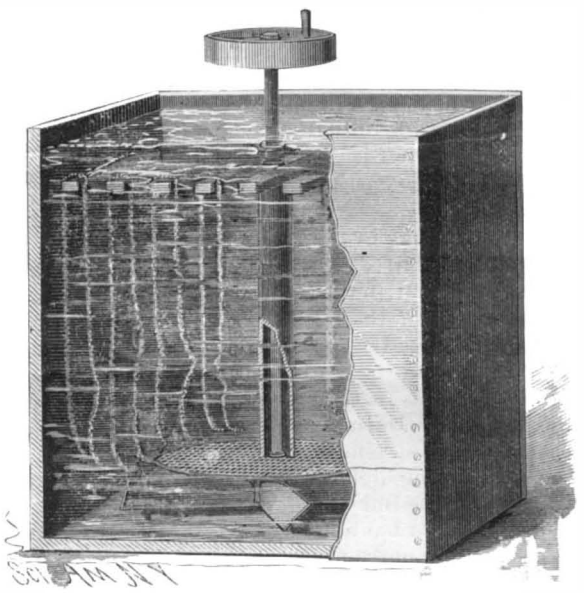
Figs. 2 and 3.—LONGITUDINAL AND TRANSVERSE SECTIONS.

I. The fine wire bobbin, mounted in derived circuit, produces a magnetic field that is at every instant proportional to the difference of potential, E, of the two points where it is fixed. The changes of level in the mercury are consequently proportional at every instant to the product, E I; that is to say, proportional at every instant to the number of watts expended in the part of the circuit considered.

Aside from the originality of the principle of Mr. Lippmann's apparatus, they all present the valuable feature of furnishing indications which are accurately proportional to the extents to be measured, and this obliges us to use them in a large number of cases in which we could not rely upon measuring by points, a method in which so many causes of error intervene to destroy accuracy.—*E. Hospitalier, in La Nature.*

IMPROVED LIMING VAT.

The accompanying engraving shows a vat in which hides may be evenly, thoroughly, and quickly limed, so that the hair can be easily and rapidly removed, and without damage to the hides by too long exposure in the liming liquid. The hides are hung from a rack formed of bars fitted across the tank. In the center of the middle rack timber is fitted the end of a tube which hangs nearly to the bottom of the tank, and has on its lower end a screen frame made of wire netting or wooden slats. In this timber and in a step bearing at the bottom of the tank is journaled an upright shaft, which passes inside of the tube and is rotated by means of a crank or pulley. Upon the lower end of the shaft, beneath the screen, are radial arms or paddles made with inclined blades, so as to induce



JOHNSTONBAUGH'S IMPROVED LIMING VAT.

strong upward currents in the liquid when the shaft is revolved, thus carrying the lime particles tending to settle at the bottom of the vat upward into contact with every part of each hide hung from the rack. Attached to the shaft at a point a little below the surface of the liquid is a paddle, which prevents the accumulation of lime at the surface and the undue settling of lime upon the hides at the rack. The screen frame prevents the shanks and tails of the hides from catching in the lower stirrer, and the tube prevents the entanglement of the hides with the shaft.

This invention has been patented by Mr. Thomas Johnstonbaugh, of Clearfield, Pa.

Meaning of Colors in Sealing Wax.

The language of flowers is supposed to be known by every educated person, at least those capable of blushing. But who knows the language of the colors in sealing wax? We are indebted to the Philadelphia *Times* for the following information: "Flirtations in sealing wax are the latest racket," said a stationer. "The ordinary red wax signifies business, and is supposed to be used only for business letters. Black is, of course, used for mourning and condolence. Blue means love, and as we make four or five tints of this color, each stage of the tender passion can be accurately portrayed. When pink is used, congratulation is intended. An invitation to a wedding or other festivity is sealed with white wax. Variegated colors are supposed to show conflicting emotions. Do you know that thimbles are being utilized to bear seals? Fact. The designs of that sort are mild just now, but are developing. We'll work the idea up, and think it will become fashionable. The odors used in the wax are ravishing in their delicacy—that is, the expensive sort. The cheaper grades are as bad as the pomatum of a five cent barber shop. The perfumery is the element of cost in the wax. A Paris firm makes the finest imported article. The perfume of burning wax fills an ordinary sized apartment, and lingers about the envelope for hours.

Sky Rocket Torpedo.

Recent experiments with an improved torpedo at the Washington Navy Yard, says a special from that city, have resulted in the attainment of a velocity of 100 feet in 10 seconds, the line of firing being almost perfectly straight across a current of over two knots an hour. This torpedo is discharged out of a tube, and is propelled by a rocket composition which is held in an iron tube sixteen inches in diameter and forty-two inches long. The explosive charge is so arranged as to be detached upon contact, and shot forward and downward for explosion underneath the armor of a vessel.

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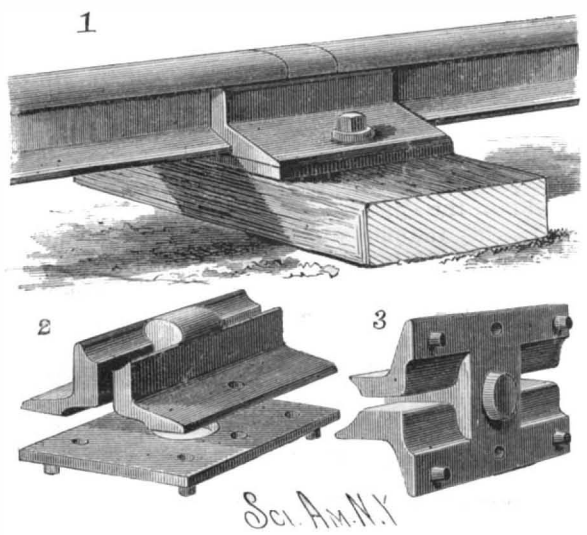
IMPROVED RAIL CHAIR.

The engraving shows a rail chair that prevents spreading and creeping of the rails, and forms good joints. The chair is formed of two side pieces, having their inner sides curved and shaped to fit snugly against the sides of the rail. These pieces are united at the middle by a cross piece extending from top to bottom, and having its top shaped the same as the head of the rail. The recesses between the plates are so shaped that an end of a rail can be passed in between them, the ends of the rails abutting against the ends of the center cross piece, as shown in Fig. 1. The outside plate is slightly higher than the inside one (Figs. 2 and 3), to form a flange for carrying the wheel over the joint. Tenons project downward from the under side of the cross piece and from each end of each side piece, and an aperture is formed in the middle of the lower part of each side piece; the tenons fit in apertures in a bottom plate. Tenons on the under side of



JAQUES' IMPROVED RAIL CHAIR.

this plate fit in holes in the tie. This plate is also provided with apertures corresponding with those in the side pieces, and through which the bolts holding both parts to the tie are passed. The lower ends of the bolts are countersunk in the ties, and elastic washers are placed under the nuts. It will be seen that the chair forms an even joint, holds the rails securely, and cannot creep or give laterally.

This invention has been patented by Mr. George W. Jaques, of Burton, Ohio.

Old Shoes Remade.

It may be a surprise to some people to learn that the old shoes cast into the ash barrels are liable to reappear in the boudoir and parlor. A New York reporter who saw a couple of rag pickers quarreling over a lot of worn out and seemingly worthless foot gear interviewed one of the chiffonniers, and found that they sold them to the manufacturers of wall paper. He followed up the clew, and on questioning the foreman of one of these establishments elicited the following bits of information.

"We buy," said the foreman, "all the boots and shoes that the scavengers can bring us. We pay different prices for the different qualities of leather. A pair of fine calfskin boots will bring as high as 15 cents. We don't buy cowhide boots. The boots and shoes are first soaked in several waters to get the dirt off them. Then the nails and threads are removed, the leather ground up into a fine pulp, and is ready to use.

"The embossed leather paperings which have come into fashion lately, and the stamped leather fire screens, are really nothing but thick paper covered with a layer of this pressed leather pulp. The finer the quality of the leather, the better it takes the bronze and old gold and other expensive colors in the designs painted on them. Fashionable people think they are going away back to the mediæval times when they have the walls ot their libraries and dining rooms covered with embossed leather. They don't know that the shoes and boots which their neighbors threw into the ash barrel a month before form the beautiful material on their walls and on the screens which protect their eyes from the fire.

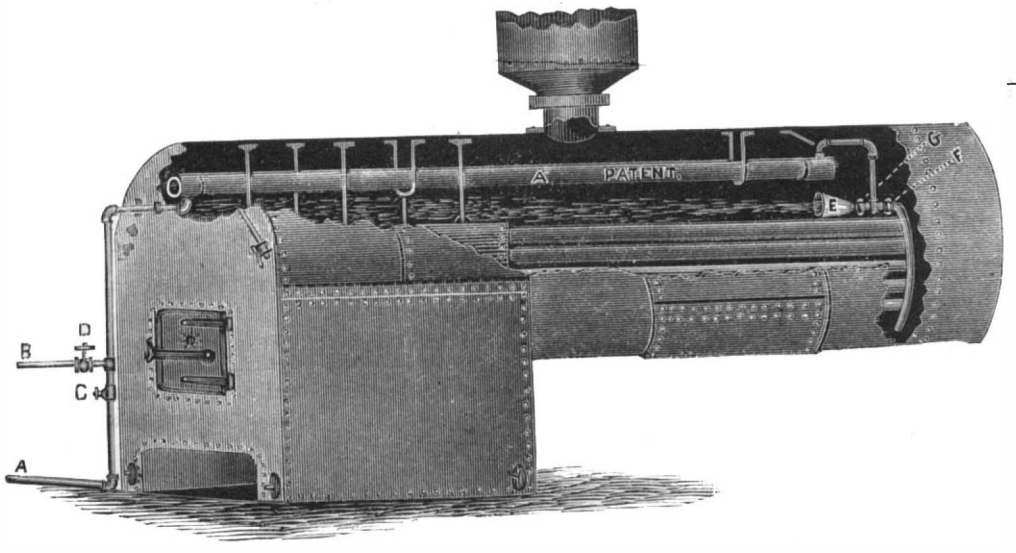
"We could buy the old shoes cheaper if it were not for the competition from carriage houses and bookbinders and picture frame makers. I don't know how many other trades use old shoes and boots, but the tops of carriages are largely made of them, ground up and pressed into sheets. Bookbinders use them in making the cheaper forms of leather bindings, and the new style of leather frames with leather mats in them are entirely made of the cast-off covering of our feet."

Steam for Extinguishing Fires.

The New York Steam Heating Company, who have had their pipes laid under the streets and furnished steam for heating and power for operating all kinds of machinery, in the lower part of this city, are now extending their pipes further up Broadway, and in time they expect to compass the entire city with their heating system. The editor of the *Fireman's Journal*, in a conversation some months ago with the secretary of the steam heating company, was informed that before long the company would be prepared to put out fires in that portion of the city covered by their mains. Recently W. C. Andrews, president of the company, explained definitely the plan they propose to adopt in the dry goods district for putting out fires. He said: "The use of steam for putting out fires is not new. It is in operation in a great many large factories all over the world. There has never been any public system, because the conditions have never existed before under which it could be put in operation. The steam drives out the air and smothers the fire, and does not damage the goods as water does. By putting stand pipes in each building, with four or five inch nozzles on each floor, which could be turned on from the street, the steam could be turned on in any part of the structure. It would be so light a draught on our boilers that I doubt if it would lower the pressure to put out any ordinary fire. The dry goods district contains more inflammable material than any similar territory in the world. It is inadequately protected at present." This might do well enough in confined spaces, but where the air has full access to the flames firemen are of the opinion that the fire would beat the steam every time. Still, we hope the experiment will be tried, for it may be made a valuable auxiliary to the fire department.

IMPROVED BOILER CLEANSER.

The engraving shows a simple and effective scale or sediment remover and preventer, which, being purely mechanical in its operation, does not require the use of any chemicals. The feed pipe, A, is continued in the boiler, either in an annular or plain form, as required, and is fitted with a branch having two check valves, F and G, the former opening with the line of feed, and the latter, which is connected to a skimmer, E, placed at the ordinary water level, opening against it; the feed pipe is continued from the valve, F, to discharge at whatever point (H) required. On entering the boiler the water in the feed pipe begins at once to rise in temperature, and as deposit and precipitation commence at about 250° Fah., all salts and other impurities are gradually deposited on the bottom of the pipe —the feed water, with all light, non-depositable matter, keeping its flow to the discharge point. Then, every twelve, eight, four, or two hours, according to the quality of the water or the rate of evaporation, the blow-off valve, D, is opened for a minute or two, thus causing the check valve, F, to close by the internal pressure of the boiler, and the check valve, G, to open, when the surface scum, oil, and water, rushing back, carry all deposit out of the feed pipe, through the blow-off pipe, B, into tank drain or heater, as may be required. A very small blow suffices to clear everything out, as all the substance to be discharged is located in one place, ready to be blown out. When a slight scale is necessary for the protection of the iron, a small portion of the feed water may be permitted to go to the boiler direct through a branch placed between the feed pump and the valve, C. This "cleanser" keeps the water in the boiler pure, separates the foreign matter, and discharges it by means of the oil, scum, and other matter too light to settle.

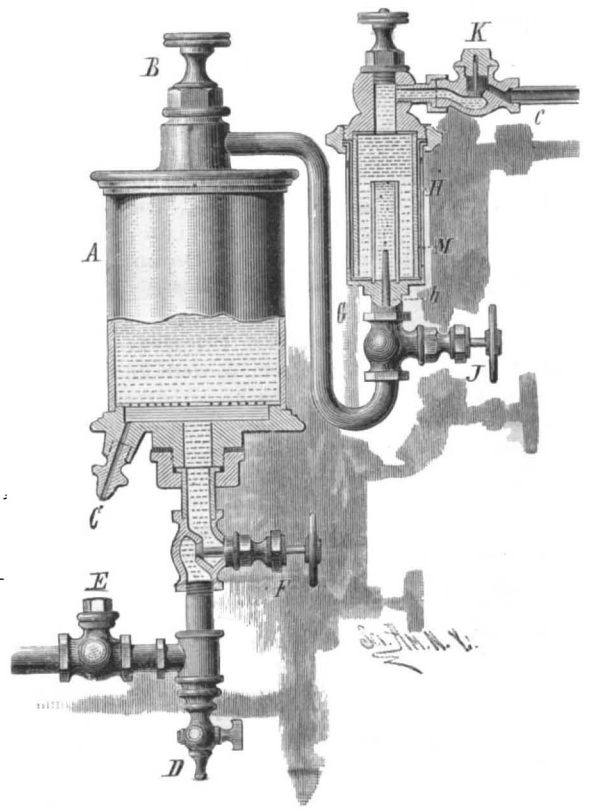


WASS' IMPROVED BOILER CLEANSER.

Further information can be obtained from Mr. J. C. Henderson, agent, 313 Bush St., San Francisco, Cal., or from the patentee, Mr. D. D. Wass, same address.

IMPROVED LUBRICATOR.

In this lubricator, designed for locomotive, marine, and other steam engines, the oil is supplied by the pressure of the steam, and is fed in a fine stream, or drop by drop, by its passage through a fluid of different specific gravity to it within a glass chamber, which admits of the amount of supply being seen and readily



BARCLAY'S IMPROVED LUBRICATOR.

controlled as required. Near the bottom of the cup, A, is a perforated diaphragm with solid center, by which a general pressure on the oil may be obtained. Attached to the cup are a filling cup, B, a cup drain, C, a lower pipe drain cock, D, a check valve, E, in a branch by which steam is admitted from the boiler, a hand valve, F, for regulating the supply of steam to the cup, a pipe, G, for supplying oil from the cup to the indicator or receiver, H, through a small discharge pipe, *b*, a cap, I, on top of the receiver, a hand regulating valve, J, and a check valve, K, in the pipe, *c*, which conveys the oil to the engine. The inventor of this lubricator found that by supplying the transparent indicator with a liquid of greater specific gravity than water, preferably an acidulous liquid—such as vinegar, citric, acetic, or sulphuric acid—the feed of the oil in drops was more perfect, and the glass of the indicator retained its transparency for a much longer period, than could be obtained with water, the oil not settling on the glass to the same extent when an acidulous liquid was used. The glass indicator is not supplied direct with the liquid medium, which is held in a glass tube, M, of about two-thirds the height of the outer glass of the indicator. The small oil discharge pipe, *b*, enters through the closed bottom of this tube, which is of such size as to leave an oil space surrounding it. By this arrangement the outer glass simply contains oil, while the inner contains the denser fluid, and a good working capacity is obtained without interfering with the transparency of the indicator. This lubricator may be easily adjusted to feed any desired quantity, is accurate and reliable, and those which have been in constant use many months present as clear a view of the oil as when first set up.

This invention has been patented by Mr. Peter Barclay, whose address is Cunard Wharf, East Boston, Mass.

Indelible Ink for Paper.

Its indelibility depends on the fact that when bichromate of potassium and gelatine come together, particularly in the form of a thin film, in the presence of daylight, the film becomes insoluble in hot or cold water. A good formula is the following: Gelatine 2 grs., bichromate of potash 2 grs., nigrosine 10 grs., water 1 fl. oz. Dissolve the gelatine and nigrosine in most of the water, and the bichromate of potassium in the remainder. Mix the two solutions in an amber colored bottle. If it is found that the ink "gums" in the pen, the quantity of gelatine and bichromate may be somewhat reduced. But the ink, when properly made, and dry, cannot be entirely removed from paper by hot or cold water, acids, or alkalies.

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The American Association for the Advancement of Science.

The thirty-fourth meeting of the American Association for the Advancement of Science will be held at Ann Arbor, Michigan, from August 26 to September 1. Bar Harbor, Maine, was the locality originally chosen, but as suitable accommodations could not be secured, it was changed by invitation to the University of Michigan. The absence of the students during the summer leaves their quarters available, and no difficulty will be experienced in obtaining ample accommodation. Reduced fares have been obtained, and a special through train will be run from Buffalo on the 25th, allowing two hours at Niagara. A complimentary excursion to the Saginaw Valley will be given during the session. The retiring President, Professor J. P. Lesley, of Philadelphia, will deliver his address on the evening of the 26th. The President-elect is Professor H. A. Newton, of New Haven; Permanent Secretary, F. W. Putnam, Salem, Mass.

Progress in Calico Printing.

Dr. Otto N. Witt, a gentleman well known in the world of color chemistry, has been delivering an address to the Society for the Development of Industry in Berlin, and we select some of the most salient points of his paper, thinking that they will be perused with interest by our readers. The most important improvements have taken place in the field of chemistry applied to calico printing, and the Alsatian industry can be taken as the first brilliant example of what has been accomplished.

To begin with, it is necessary to mention the study of the changes undergone by the cotton, or rather the cellulose, when exposed to certain influences, and to note the observations of Witz, and then of Messrs. Cross and Bevan, on the formation of oxycellulose, with which our readers are well acquainted. The introduction of the alkaline chrome mordant is also of recent date, and so is the alkaline iron solution in glycerine, of which also our readers have not failed to take notice when we published accounts on same some time ago. The manganese styles are not so much used as they used to be; and the manganese brown is now principally used as a kind of mordant for fixing deep shades, by means of sulphate of aniline or naphthylamine or other organic aromatic amines, to obtain a ground on which white or colored discharges are produced. The colors produced by this means are all fast against light, air, and soap. Great variety of shades can be produced by employing the amines on goods previously prepared with manganese brown; for instance, if the goods are treated with sulphate of aniline, a black can be formed, while sulphate of naphthylamine produces a red brown color, which has not been as yet well studied, but which is accepted as being similar to aniline black. Beta-naphthylamine, under the same circumstances, produces a brown which is not easily distinguished from the original manganese bister brown, but which has the advantage that it cannot be altered by reducing agents. Other basic products have been tried for the same purpose, and it is likely that some of them are used, although their employment is kept secret. The employment of indigo in printing is next mentioned, and the well known methods of producing patterns by resisting and discharging are shortly described, and special reference is made to Koechlin's method of discharging by printing a thickened solution of a neutral chromate and afterward passing through a weak, warm bath of sulphuric and oxalic acids, the latter being employed in order to decompose the free chromic acid which is formed, and which, after having destroyed the indigotine, if not removed would tender the cloth; this is of course for white discharges, while light blues are produced by employing a weaker chromate color, and colored discharges by printing principally, along with the latter, any pigment in connection with albumen, which is coagulated by the acid bath and the colors thus fixed on the fiber, while at the same time the indigo is discharged. The discharging by means of chlorate of alumina is useful for fixing at the same time the alumina mordant on the cloth, which is then capable of taking up alizarin and thus produce blue and red designs.

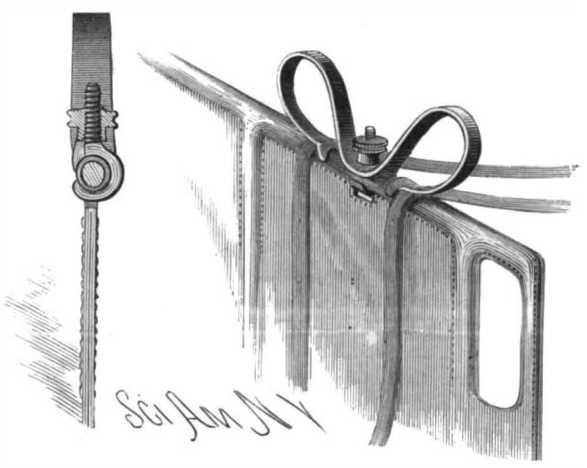
The now well known process of printing with natural indigo by the Schlieper and Baum process is brought under notice, and its advantage described. Of course alizarin blue is also mentioned; as also indophenol, which has found very little employment in calico printing, while it has been found very useful in woolen printing for producing red and blue patterns in connection with the azo reds. For this purpose the reduced indophenol blue has the property of destroying the azo scarlets, and of this discharging power of the blue paste it is taken advantage in order to produce red and blue effects, which are very much liked on woolen goods. Of the other indigo substitutes employed in calico printing the author mentions the one derived from logwood, and about which there still seems to be very much mystery in the minds of some chemists, although it is produced by a very simple process.

Gallocyanine has been found pretty useful in printing and in connection with Persian berries, as another of the many and yet unsuccessful competitors as substitutes for indigo. Galleine and ceruleine are next passed in review, and induline, which latter is now printed in paste form by means of methyltartaric acid. By steaming, the methyltartaric acid is decomposed, the free alcohol produced dissolves the induline, and fixes it on the fiber as a pigment. Of the red coloring matters the author mentions, besides alizarin, the new bisulphite derivative of azo scarlets, the so-called azurin, which, he states, yields pretty fast shades by means of acetate of alumina, and for the production of yellower tone the employment of a new yellow azo color is recommended, the flavophenin, which goes on cotton in a simple soap bath and yet produces shades which are stated to be fast.

In late years great attention has been paid to such coloring matters as can be fixed on cotton without any preparation, and canarin and Congo red belong to this class. In conclusion the author mentions the formation of the cadmium yellow and the chrome yellow, which stand sulphur fumes, as well as the steam chrome yellow in connection with citrate of ammonia. —*Tex. Mfr.*

REIN HOLDER.

This simple device for holding the reins on the edge of the dashboard has been patented by Mr. George O. Teeter, of Teeterville, Ontario, Canada. A steel strip is bent upward from the middle to form two open spring loops, the free ends of which are brought back to near the middle of the strip, the ends being formed with flanges bent to fit on the top rod of the dashboard. The middle of the strip is apertured to receive the threaded shank of a hook on which a thumb nut, resting on the upper surface of the strip, is screwed. The strip being placed upon the rod of the dashboard (the hook catching the rod as shown in the sectional view),



TEETER'S REIN HOLDER.

the nut is drawn up tight, whereby the middle of the strip and free ends of the loops are pressed firmly on the top of the dashboard. The flanges prevent the ends of the loops from slipping off the top edge. The reins are pulled in between the bottom free parts of the loops and the top edge of the dashboard, where they are securely held.

Naphthol.

The extraordinary power of naphthol as an antiseptic and disinfecting agent has been known for a long time, but its disagreeable smell and the difficulty of preparing it in a purified state, with the occasional toxic action of the crude naphthol, have been a bar to its use as a remedial and antiseptic agent. Justus Wolff, a chemist interested in coal tar products, has recently succeeded in producing it in a pure and odorless state in well defined crystals, and claims its antiseptical action is much greater than that of carbolic acid. Recent research has demonstrated that the toxic effects of crude naphthol were due to the impurities it contained. Dr. Shoemaker, of Philadelphia, in a paper read before the Philadelphia County Medical Association, on the Medical Use and Value of Naphthol, conclusively proved the non-poisonous character of the purified or odorless naphthol by taking large doses internally. It has no corrosive action on the skin, and will not injure textile fabrics.

As a remedial agent it acts with greater efficiency, and has many advantages over carbolic acid; the fact of its being absolutely odorless will make it a desirable substitute. It is expected that it will shortly be produced on a manufacturing scale as a substitute for carbolic acid.

PROF. HUXLEY, who has been ill for several months past, is about to retire on a well earned pension from his duties at the South Kensington Museum. Mr. Huxley has seriously overtaxed himself, and his malady is nervous prostration, from which it is hoped by his friends that he may be speedily relieved. If the complete rest which he now consents to take should fail to restore his impaired health, he will also retire from the presidency of the Royal Society next November.

Alarm Photometer.

An ingenious automatic method for signifying the rate of consumption of candles used in photometrical work has been devised by Dr. Hugo Kruss, of Hamburg, for the gas examiners of St. Petersburg, and has been recently described and illustrated in the *Journal fur Gasbeleuchtung*. The arrangement is very simple. The candleholder is hung in an unequal arm balance, as in the Sugg-Letheby photometer, in the position required for making an observation. The beam of the balance has a long pointer hanging down from the fulcrum, which marks the position of the balance on a vernier scale at the foot of the pillar. There are, as usual, two metallic pins at the two opposite ends of this scale; and in the middle a movable pin which is in electrical connection with a battery and a bell. Directly the pointer comes into contact with this pin, the circuit is completed and the bell rings. The method of using the balance is readily understood. The candles, being lighted and fixed in position, are weighed until the pointer just swings clear of one stud of the vernier, when any desired weight may be placed in the pan provided for the purpose underneath the candles, the clock being started at the same moment. Observations may then be taken while the candle burns; and the instant the weight placed in the pan is lifted by the consumption of the candles and the weight in the opposite pan, the pointer swings back and touches the pin, which completes the circuit and so rings the bell. This, of course, indicates, in conjunction with a glance at the clock, the precise rate of consumption of the candles, without touching or in any way interfering with them. The arrangement is a very neat one; the battery, electro-magnet, and bell being mounted on the balance stand, and all contacts being so placed as to be readily removed out of the way when not required. For this a special form of cell is used, with an arrangement for preventing waste when not required for the purpose specified.

Hints for Buyers of Machinery.

Messrs. R. Hoe & Co., the well known printing press builders, give the following practical suggestions, intended without doubt to apply to the purchaser of printing presses, but their hints are equally pertinent to other classes of machines:

"In buying a machine see that, whether new or second hand, it is strong and well made. Consider the standing of the maker, both as mechanician and machinist. A light framed or shakily fitted machine will be dear at any price. Do not be deceived by any beauty of paint or finish on exposed work, which adds nothing to the usefulness of the machine, and which may draw the eye from an examination of the working parts. Uncover the boxes, and see whether the finish of shafts in their bearings, of journals, is as smooth and true as the white and brass work of more exposed pieces. Take out, here and there, screws and bolts; see if the threads are deep, sharp, and well fitted. Look closely at the fitting of all toothed or pinion wheels; note whether they have been cast and filed to fit, or whether they have been accurately cut by automatic machinery, so that they will fit in any position. Slowly turn pinion wheels, and note whether there is any rattling or lost motion, or whether the teeth fit snugly, yet freely, so as to give even, steady motion. Closely examine all castings for pin holes or air bubbles, which may be most easily detected in work that has been planed. See that castings are heavy as well as solid. Look after oil holes and provisions for oiling. See that the castings are neatly fitted; that they do not show the marks of the hammer or file, which must be used to connect them if they have been forced or badly put together. Pay attention to the noise made by the machine when in motion; if fairly fitted, the noise will be uniform; if badly fitted, it will be variable or grating."

Eating Lemons.

A good deal has been said through the papers about the healthfulness of lemons. The latest advice is how to use them so that they will do the most good, as follows: Most people know the benefit of lemonade before breakfast, but few know that it is more than doubled by taking another at night also. The way to get the better of the bilious system without blue pills or quinine is to take the juice of one, two, or three lemons, as appetite craves, in as much ice water as makes it pleasant to drink without sugar before going to bed. In the morning, on rising, at least a half hour before breakfast, take the juice of one lemon in a goblet of water. This will clear the system of humor and bile with efficiency, without any of the weakening effects of calomel or Congress water. People should not irritate the stomach by eating lemons clear; the powerful acid of the juice, which is always most corrosive, invariably produces inflammation after a while, but, properly diluted, so that it does not burn or draw the throat, it does its medical work without harm, and, when the stomach is clear of food, has abundant opportunity to work over the system thoroughly, says a medical authority.

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FINAL OPERATIONS FOR THE REMOVAL OF FLOOD ROCK.

Flood Rock, a ledge of gneiss situated about one-quarter of a mile from Hallet's Point, Astoria, L. I., is one of the most formidable of the many obstructions by which all the commerce passing through Hell Gate has been menaced. This rock forms a very irregular obtuse cone, only a small portion of the apex of which comes above water. This formation and its location in the bend of the river almost in the center of a swift current at each change of the tide make it an object of great dread to pilots. The work of removing this rock was begun in 1875, and after unnecessary and costly delays caused by the failure of Congress to appropriate sufficient money from year to year the entire excavation has been completed, all the drill holes have been bored, and all that remains to be done is the charging of the holes with explosives, removing the plant, and dredging the broken rock after the firing. The total cost of the improvement will be about $1,000,000.

The method pursued may be briefly described, the familiarity of our readers with the undertaking rendering a detailed account uncalled for. A shaft was sunk at the highest point of the rock to a depth of 60 feet below water level, and from this shaft galleries were extended parallel with and at right angles to the current. These galleries are 25 feet between centers, and extend under all the rock to be removed. It was not the design to remove the rock as much as possible by means of these tunnels—owing to the fact that it would be cheaper to dredge the broken rock after the explosion—which were only expected to serve as passageways honeycombing the rock and through which access could be had to all parts in order to place the powder. Absolute regularity in the spacing of the galleries could not be maintained owing to inequality in the texture and formation of the rock. The plan view in the accompanying illustrations shows the present condition of the excavation, and, being drawn to scale, it presents a good idea of the magnitude of the work.

Thus was formed an immense chamber, averaging about 10 feet from floor to ceiling, having a stone roof averaging about 15 feet in thickness and supported by 467 rugged and massive columns. In this chamber, running parallel with the East River, are 24 galleries, the longest measuring 1,200 feet, and running at right angles to the stream are 46 galleries, the longest of which is 625 feet. The area covered by the chamber is about 9 acres. The aggregate length of the galleries is 21,670 feet.

The mining operations were not attended with unusual risk either to the men or the work; the main danger was from the flooding of the mine through the opening of a fissure, or the meeting with a rock "keyed the wrong way," which would admit the water in quantities too great to be handled by the pumps. Fissures were frequently encountered, but fortunately none of excessive size; the large holes were plugged with wood, loose filling, such as cement, being unavailable because of the great pressure of water, some 26 pounds to the square inch. To escape the drippings and in some cases the pourings from the roof, and to enable the visitor to walk dry shod through the small brooks running down some of the galleries, he is, through the kindness of those in charge of the work, encased in rubber from head to foot.

The northeastern portion of the excavation, having an area of about one acre, was through rock very irregularly fissured, and as the roof approached closer to the bed of the river great care was exercised in driving the headings; in some places it was found expedient to support the roof and sides with heavy timbers, as shown in Fig. 2. In order that the caving in of any part of this section should not flood the main work a strong door (Fig. 3) was early built in the gallery connecting the two sections. Attached to the outer edges of this door is a rope, leading over a pulley in the casing and along the gallery to the shaft; the door can thus be easily and quickly closed, should it become necessary at any time to shut off the weak portion of the work.

Thirteen thousand two hundred and eighty-six holes have been drilled in the columns and roof, the holes being 3 inches in diameter and having an average depth of 9 feet; these holes, if placed end to end, would reach over 22 miles. During the progress of the work an accurate plan was kept, showing the location and number (Fig. 7) of each hole, together with its inclination and depth. Fig. 6 shows this hole plan for one column—the shaded portion—and the adjoining galleries, the centers of which are represented by the dotted lines. The holes in the columns are about 5 feet apart, and extend upward at an angle of about 45 degrees; the holes in the roof are about 4 feet apart, and are at an angle of 60 or 65 degrees. No holes were drilled near the floor. Each hole will be filled partly with "rackarock" powder and partly with No. 1 dynamite. The form of the cartridge is shown in Fig. 8, the projecting wires shown at one end being intended to hold the cartridge in position in the hole. Fig. 5 shows the method of charging the holes. A small car is provided with several frames, made to fit on top of the car, and each being about the size of the car; the frames can be placed as needed, one on top of the other, thus furnishing a platform from which the holes in the highest galleries can be reached. The track consists of two movable sections, about 15 feet long. Should no delay occur, it is expected to complete the charging of the holes by the first of October.

The next operation will be to remove all the machinery and buildings, and the top of the island down to the water's edge. Of course, much of this work can be done during the time of charging. The mine will then be flooded and the charge exploded by means of electricity.

The engraving, Fig. 1, shows the drainage ditch or deep gallery, extending across the mine a short distance north of the shaft. The longitudinal galleries cross this ditch, which at the point shown in the cut is some 35 feet from the floor to the roof, by wooden bridges. Extending around the southern part of the mine and along the eastern extremity is a second ditch, connecting with the first; a third ditch leads from the eastern side to the sump, just east of the main shaft (Fig. 9), where pumping engines having a capacity of 4,000 gallons per minute are located. This plan of draining the mine by means of a ditch around the extremity was made necessary by the slope of the river bed; in order to leave sufficient rock in the roof, the galleries slope downward from the center.

The work was planned and has been carried forward by Gen. John Newton, Chief of Engineers U. S. A. We are indebted to the courtesy of Lieut. G. McC. Derby, superintendent of the work, for the privilege of examining the mine, and for data.

Railway Economy.*

There is little risk in saying that there is nothing in this world less understood than the true inwardness of economy. It is not economy to save a dollar when it costs $1.50 to accomplish this saving, and yet this is the method that is practiced to a great extent by individuals and corporations. To a certain degree a little false economy is admissible, but this applies to individuals who undertake to do business with limited means and with a hope to make things more substantial and safe in the near future. It is vastly different with a corporation that has unlimited means, and uses inferior material because it can be bought for a merely nominal sum as a matter of economy. Too much economy has been the death of more people than were destroyed in Buddensiek's buildings, and some of our American railways have been great sufferers by it.

Some years ago it was considered economy to use steel rails in place of iron, and that was true. For a time we had good, honest steel rails, and they were durable and safe, and notwithstanding their excessive cost, it was considered economy to use them. But after a time the ingenious rail maker discovered a way to work in slag and cinders, and make a steel rail much cheaper than a good iron rail could be made for. The rail makers could hardly be blamed for this, inasmuch as railway officials refused to pay a good price for a good article, but gave contracts to the lowest bidder regardless of quality. Not long ago a gentleman was negotiating for a position as superintendent of a rail mill, when he was questioned very closely as to the amount of slag he could work into a steel rail. The desire to manufacture shoddy railway material did not originate with the manufacturers. The railway officials, by their refusal to pay fair prices for honest, good material, have forced manufacturers to make use of all the tricks known to the trade and to invent new ones, and this has been practiced to such an extent that the steel rails now coming into general use are far inferor to third class iron rails.

Steel rails are put forth in all the railway advertisements as an element of safety, and people embark on a steel rail track with a feeling of security; whereas if they knew they were riding on an iron rail track, they would feel decidedly uneasy and unsafe. The truth is, broken rails are becoming more frequent, while we should reasonably expect that accidents from broken rails would diminish as steel rails are put in use. A poor steel rail is not as good as any kind of an iron rail, and the economy that supplies them is very thin. It is rather expensive to provide good, honest rails, but it does not cost nearly as much to lay a track with good rails as it does to fish a train out of a ditch every few days.

And aside from rails, there are other fixtures and appliances that are of very inferior quality purchased under the same false economy that inspired the purchase of shoddy rails. I have examined piles of broken rails, links, pins, wheels, and axles, and have never been able to discover a fracture in good, honest material. It is true that defects will escape the watchfulness of the most vigilant inspectors, but the failures of good, honest appliances are rare. I have seen piles of new links and pins that were made on contract at ruinous prices for good material. I have taken links and pins out of these piles, and with a single stroke aross an anvil broken them like a piece of cast iron. The business of the manufacturer was to deliver them and get his pay for them, and the quality corresponded with the price.

Some railway officials plead poverty as an excuse for providing cheap material. This reminds me of what Horace Greeley said in a speech at an agricultural fair. He said that a wealthy farmer could afford to do some very slovenly farming, but a poor man could not. The idea was that the wealthy man would not suffer by his indiscretion, whereas a poor man would get poorer by reason of his slack attention to business and slipshod way of doing it. When we find a successful business man, we naturally think that he gets the best the market affords. Why do not corporations do the same, and get the best? The motto should be with every railway official, "Get the best."

There is no place where folly is more exemplified than in the purchase of railway supplies. Too much legislation is not good, but we, the people of the United States, wish to have it enacted that no railway or other corporation shall build or operate any road unless constructed with good, honest material. The worst economy in this world is buying poor railway material, and the most successful roads are those that have always been thorough in their equipment and repairs.

There is nothing that will put a railway into the hands of a receiver sooner than a thorough practice of the kind of economy under consideration. Look into a keg of spikes bought at less than bottom prices, and you will see many of them without heads and more without points; many of them burned in two, and but very few in a keg will stand driving, and if they do, the heads soon break off, and they become worse than useless. Splice bar and bolts of inferior quality are purchased at low rates, while cheap and dirty lubricants cause hot boxes, cutting of expensive bearings, and trouble generally; cheap wheels, cheap axles, cheap running gear and brakes, cheap fuel, cheap bridges, cheap ties and drainage, cheap pegs and switch fixtures, cheap and overworked employes and operatives, and cheap everything, all of which have, combined, produced nearly all the serious railway accidents on record. "Failure of track and equipment" is the verdict in a large share of the accidents that are recorded, and it is safe to say that 90 per cent of all railway accidents are the result of too much so-called economy.

Not long since the writer was in conversation with a railway official, and the former mentioned the fact that some roads which he named rarely met with an accident, while others were always in trouble. "Yes," said he, "the roads you mention are abundantly able to use first class material and keep everything in first class condition, which prevents accidents." Now, the fact in the matter is that the roads named as free from accidents were as poor in their early days as any roads in the country, but the managers thereof made it a rule to get the best, and preferred to pay liberally for safety appliances rather than drain their treasury on damage accounts. It is not the amount of traffic that fills the till so much as the amount saved by preventing accidents.

Any one who will take the pains to look into the financial condition of American railways and get a correct history of their management, will not fail to notice that those that are the most popular, and pocket the largest percentage of earnings, are those that have been kept in the best possible condition for safe traffic regardless of expense. He will also notice that the roads that furnish shoddy material, and are impoverished by the disasters resulting therefrom, have a weakness for costly private palace cars for the officials, and thus, with railways as with individuals, poverty and style go hand in hand. It is time a reform was inaugurated in this matter, and some genuine economy practiced. We have had too much false economy, and want a change.

* Wm. S. Huntington, in the *American Railroad Journal*.

A New Use for Toads.

The latest and most ingenious way of getting rid of roaches and water bugs we have heard of, is related of a citizen of Schenectady whose kitchen was infested with them.

A servant, hearing that toads were an antidote, caught three ordinary hop toads, and put them in the kitchen. Not a roach or water bug, it is stated, can now be found in the house. The toads have become domesticated, never wander about the house, and are so cleanly and inoffensive that there is no objection to their presence.

Another use for toads is to employ them for insect destroyers in the garden. They are determined enemies of all kinds of snails and slugs, which it is well known can in a single night destroy a vast quantity of lettuce, carrots, asparagus, etc. Toads are also kept in vineyards, where they devour during the night millions of insects that escape the pursuit of nocturnal birds, and might commit incalculable havoc on the buds and young shoots of the vine. In Paris toads are an article of merchandise. They are kept in tubs, and sold at the rate of 2 francs a dozen.

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Chemical Colors.

There is nothing to which chemistry has been applied which is more wonderful than the results which have followed the utilization of common gas or coal tar.

Thirty years ago the refuse of the retorts in gas works was utterly useless, and manufacturers did not know what to do with the material. Practical chemists were then applied to, and one of their first achievements was to discover that naphtha could be extracted from this refuse. After the naphtha was extracted, the tar was left, in the form of a heavy oil, and this was still more of a nuisance than the original compound. Faraday next awoke interest in coal tar by his discovery of benzine as a product of the tar oil.

In the year 1857, however, Perkins made a wonderful discovery. He found that it had aniline properties, and this discovery has almost revolutionized the trade in dyestuffs. These he found were capable of producing, under a different chemical reaction, the most brilliant and gorgeous dyes. This discovery made the long detested coal tar a most desirable product of the retorts, and then a valuable solvent for India rubber was made out of the material.

After these properties were extracted from the tar there were left heavy oils, and a residuum for which chemistry was puzzled to find a practical use. It was not until 1869 that any satisfactory result was obtained by experimenting on this refuse, and then the great discovery of alizarine was made. The importance of this discovery may be understood when it is known that in the first ten years following the introduction of the artificial alizarine into the dyestuff trade it exceeded the total amount of natural alizarine, or madder root Thousands of acres of land that had been used for growing madder were saved for corn and other cereals.

This material is shown in many forms at the Inventions Exhibition, and there is no more instructive part of the display than that which contains the stands of the various manufacturers who are producing this composition. In one part may be seen a mass of black, filthy-looking rubbish, and close by tubes of the most brilliant dyes, which are extracted from this refuse. A diagram is made to show in a graphic manner most of the products which this system of utilization is capable of giving. We have an idea that alizarine may be adopted with great results in the manufacture of printing inks, and would advise any one with a turn for chemistry to investigate this subject. It is only a few years since the discovery of a cheap oil completely revolutionized the printing ink trade, and gave us good inks at prices previously unheard of. Similar changes may still be in store, and if this useful product could be thus utilized, a fortune would await the successful experiment.

We have adduced this instance simply to show that all kinds of scientific knowledge can be made of use to the practical man. If space permitted, we might draw illustrations from the circle of all the sciences. No more useful result could follow the extremely successful exhibition at South Kensington than the drawing attention of artisans to inventions outside their own particular craft, and to show them that every species of knowledge may be brought to bear on their everyday vocation.—*Printer and Stationer.*

A New Incandescent Lamp.

Mr. Max Muthel has patented in Germany an incandescent lamp which possesses the advantage of requiring no vacuum in the globe. He has very ingeniously overcome one danger that experiments of this kind have hitherto presented, and that is the fusion of the incandescent wire. The wire used by him consists of a mixture of bodies that are conductors and non-conductors of electricity.

He takes magnesia, silicate of magnesia, etc., and porcelain clay, and forms a fine thread of them which he heats to incandescence and saturates with a solution of platino-iridium salts, and afterward raises several times to incandescence in order to reduced the absorbed salts to a metallic state. Instead of the foregoing mixture, filaments of clay may be taken and saturated with a solution of a metallic salt, which is then reduced to a metallic state through incandescence and the use of oil of lavender or some other organic substance, or through an electric current. With wires thus prepared fusion is absolutely overcome, the presence of the non-conducting substances preventing the metallic parts from melting. Mr. Muthel supposes that the electric spark jumps, so to speak, from one particle to another. and in this way causes a heating of the other substances, which, brought to incandescence, emit a more intense light.

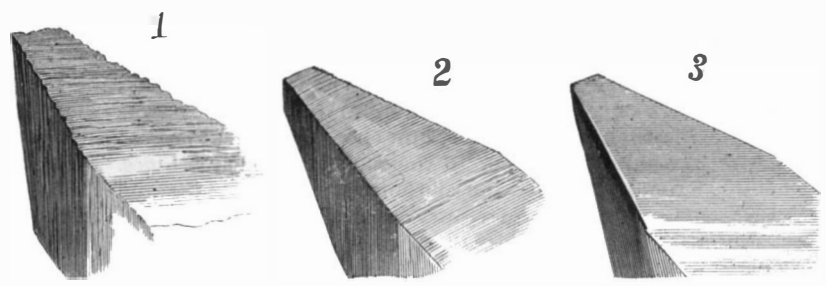
In order to make the filaments stronger, they may be covered with chrome, the melting point of which is still higher than that of platinum. To effect this, the filament is placed as an anode in a bath of chloride of chromium.—*La Lumiere Electrique.*

THE MICROSCOPE IN THE MECHANIC ARTS.

BY GEO. M. HOPKINS.

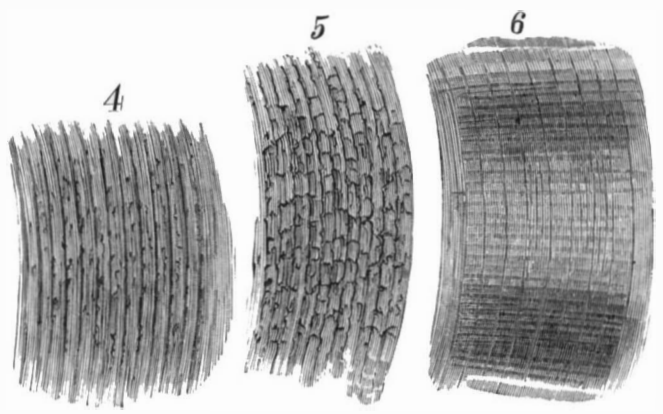
Without, for the present, taking into consideration the pleasures springing from the use of the microscope in its application to the study of the exquisite works of nature, let us see how the microscope may be applied to advantage in the mechanic arts, with the hope that its usefulness here may finally lead to something higher than its mere utilitarian application.

When line shafts were made of wood or cast iron, hexagonal or octagonal in form, with unbored wheels fitted with wooden or iron wedges or keys, and when other machinery was made in an equally crude way, and an eighth of an inch was considered a minute quantity, to have talked of the application of the microscope to mechanical work would have been as inappropriate as would be the application of the microscope of a few years ago to the high class of work of which the recent instruments are capable.



But in mechanics, and in optics, and in every other branch of scientific and practical work, great advances have been made, so that the highest perfection can be reached only by the employment of all available means for securing that perfection, and the use of instruments capable of revealing the minutest defects. The microscope has its application in mechanics not only to the finer measurements, and to the inspection of the quality of work, but its most useful application, perhaps, is to the selection of materials and the study of their behavior under different conditions.

Beginning with metal working tools and their action upon materials; while every machinist is supposed to know how to grind his tools and put them in the best condition for use, yet, for one reason or another, even the best mechanic will find that of two tools forged, tempered, and ground in apparently the same manner, one tool will work much freer, will cut cleaner, and do better work than the other.



Now, it must be admitted that the portion of the tool that really does the work is microscopic in its dimensions, and a comparison of two such tools by the aid of a microscope will reveal the cause of inferior work with one tool, and the reason of good work with the other tool. The character of the cutting edge depends altogether upon the temper of the tool and the means and methods employed for sharpening it. A tool ground upon a coarse emery wheel or grindstone will be merely serrated. If the emery wheel or grindstone happens to be out of truth, the cutting edge is liable to be rounded. If the cutting edge is produced by a true wheel, and finished by means of a fine oilstone so that a clean, sharp edge is secured, the tool will not only turn out better work, but its edge will be found very much more durable than one of a serrated character.

These peculiarities of the cutting edge can be seen to some extent with the unaided eye, but of course the microscope reveals their defects or their perfections to a far greater extent. The microscope for this purpose need not be necessarily one of the expensive sort; such a microscope or magnifier as any machinist may carry in his vest pocket will answer the purpose, although a larger and better instrument will often be found very useful.

Fig. 1 shows the edge of a diamond pointed tool as it appears under a magnifying power of about 20 diameters, showing the serrations produced by an ordinary coarse emery wheel.

Fig. 2 shows the same tool ground upon an emery wheel which is out of truth.

Fig. 3 shows a tool of the same form under the same magnifying power, the edge of which has been properly sharpened with a fine oilstone after grinding.

Fig. 4 represents the action of the tool shown in Fig. 1 upon its work; the surface of the steel turned with such tool is there shown covered with many grooves and needle-like projections.

Fig. 5 represents a piece of work under the same magnifying power, which has been done with the tool shown in Fig. 2. The microscope clearly shows that the metal, instead of being cut off, is simply bruised off.

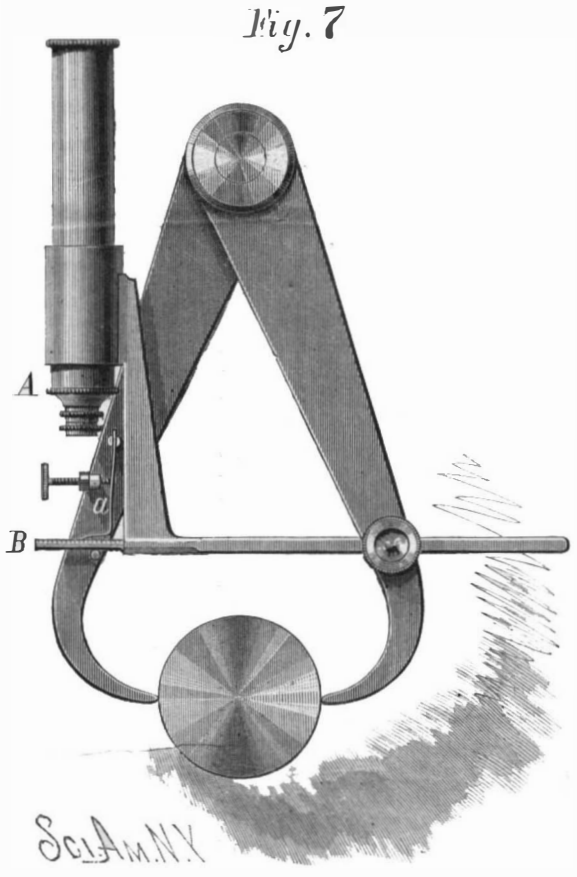
Fig. 6 represents a piece of work done with the properly ground tool. The surface of this work needs no further finish; it is absolutely true and perfect, and would not be benefited in the least by the application to it of a file or any abrading material.

What has been said with regard to the diamond pointed tool shown in Figs. 1, 2, 3, may be said with equal propriety about tools of other forms.

Every foreman or superintendent of mechanical work knows how difficult it is to find a workman who is competent to perform the apparently very simple operation of calipering. It is not common to find ordinary machinists who are sufficiently accurate in this matter to carry on their own work by calipering merely, and it is entirely out of the question for one machinist to adjust calipers for another machinist to work by. The difference of touch between the two workmen may result in a difference of between the 1-5000 and the 1-100 of an inch.

To render the operation of calipering more positive, and to establish uniformity in calipering, the microscope, A, together with a micrometric scale, B, graduated to 5000ths, may be applied to calipers as illustrated in Fig. 7. When the workman has calipered his work in the usual manner, his personal equation, if such an expression may be used in this connection, may be discovered by noting the amount of spring of the calipers as indicated by the adjustable index, *a*, carried by one leg of the calipers over the scale, B, carried together with the microscope by the other leg, and other workmen using the same calipers will, of course, reduce his work to such size as will give the same indications under the magnifier. This will permit of great accuracy in the calipering or the measurement of work.

Fig. 7



Coal Ashes for Heavy Soils.

A writer in one of our agricultural contemporaries says that for the purpose of making stiff soil friable, sifted coal ashes, where they can be readily had, are better than sand. They are more easily disseminated through the mass, and contain a small proportion of mineral salts likewise, though their merit is principally mechanical. I had a patch of clay over trap rock that, after a rain, took on the consistence of putty. I could do nothing with it. Vegetable manure it scorned, and the spade cut in it as though it was skim milk cheese. The place was made the receptacle of the winter's ashes. Two years after, it was dug up through a mistaken order in the fall. Next spring I manured it, and had it dug over. Then I planted it, of all things in the world, with melons. They were a striking success. More than that, the friability of the soil remained permanent.

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A PORTABLE COVERED HAMMOCK.

The very comfortable looking provision for the siesta, shown in illustrations, is a device of Italian invention. It possesses considerable merit as a piece of camp equipment with a most desirable compactness and portability. The end supports, as best shown in the enlarged cut, are pivoted to each other, and when the hammock is occupied, are prevented from collapsing by the longitudinal bar uniting their upper ends. This gives a good, solid support for the hammock, keeping it at an easy distance above the ground, and making it possible to bivouac at any desired point without the necessity of searching for tree or post. The supporting rope, passing under the angle of the legs, and through the metallic eye pieces at the outer extremity of the pivot, is attached to a hook on the upper side of the longitudinal bar. This arrangement makes the device easy to erect, avoiding the continual tying and untying of ropes, which under certain circumstances may make a hammock more of a bother than a comfort, and at the same time gives an admirable distribution of the strains. The greater the weight in the hammock, the more firmly are the legs and bar united.

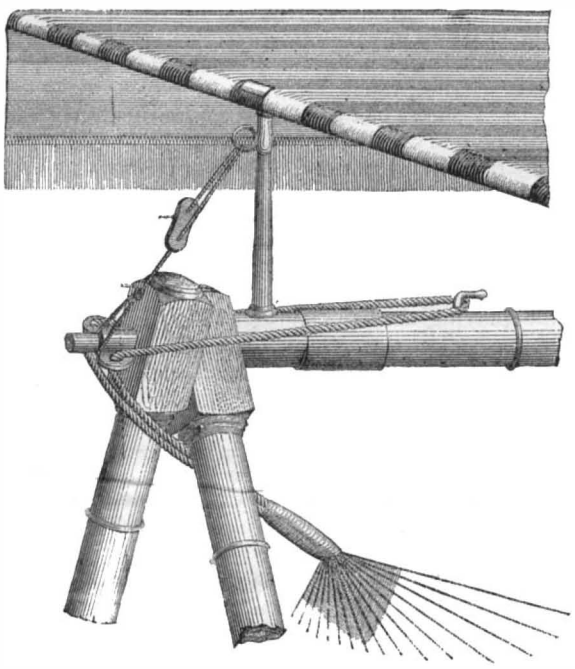


Fig. 2.—PORTABLE COVERED HAMMOCK.

Not less important to the comfort of the device is the wide spreading awning, which throws its grateful shadow over hammock and occupant. Its end rods are balanced on short uprights extending from the longitudinal bar, and the desired inclination and stability are secured by the cords attached to the pivoted legs. Perhaps the greatest merit of the invention is illustrated in the figure which shows it packed and ready for shipment. The supporting frame taken apart, and wrapped in hammock and awning, forms a bundle easily gathered into a shawl strap, and a desirable addition to the outfit of invalid or tourist.

The Ghetto of Rome.

We learn from the *Building News* that the demolition of the Ghetto of Rome, the oldest Jewish quarter in Europe, dating it is said, from before Cæsar's time, is proceeding rapidly. The archæological commission which is charged with the exploration and protection of ancient monuments has applied to the Italian Government that measures shall be taken for clearing the temple of Jupiter and the portico of Octavia from the buildings which have grown up around them, and also for putting them in such a state of repair as is necessary for their preservation. The commission also requests that the new streets which are to be laid down over the cleared area shall be so planned that their points of intersection shall coincide with the following ancient buildings, which are now within the Ghetto: The theater of Marcellus, the crypt of the Emperor Balbus, aud the porticoes of the Flavian Emperors and of the Emperor Philip. It is proposed that these buildings shall be placed on the list of ancient monuments.

BAUDRE'S SILEX PIANO.

Among the flint stones that are met with in the chalk formation there are some that when struck with another flint emit sounds of great purity. The tones that are thus obtained with different musical flints are out of all proportion to the bulk and weight of the stone. This is a very curious phenomenon, the explanation of which is not furnished by the fundamental laws of acoustics, and which surely merits being studied by physicists.

As long ago as 1873, I spoke of musical stones as a curiosity worthy of attracting attention. I then promised to return to this interesting subject, but the years passed by, and the singing stones were forgotten. Upon recently visiting the new electric lighting of the Grevin Museum, however, they were casually brought to mind again. After examining this interesting installation, I was walking through the great hall of the museum, looking at the wax figures mounted therein, when I heard some delightful music that attracted my attention. Approaching the spot where these harmonious and pure sounds were being produced, I saw a musician, who, holding two flints, was playing upon a stone piano with wonderful agility, by striking other flints of all shapes suspended by two wires at a few fractions of an inch above a sounding board. I at once made the acquaintance of the player, who was Mr. H. Baudre, a distinguished musician, and a zealous collector of musical stones.

"How did you procure these flints that render so delightful sounds, and from which you get so remarkable music?" said I.

"Ah, sir, it required much time and many trips to collect the 26 stones which you see before you, and which form the two chromatic octaves. It took me more than thirty years (from 1852 to 1883), to search for them in the chalk beds of Haute-Marne, Perigord, Eure, and the Paris basin."

"Are such flints found in all chalk formations?" "I believe not; the innumerable quantities of English flint have yielded me nothing acceptable." "Are there any works that treat of this interesting subject of singing stones?" "I do not know; but I have letters from numerous scientists, who have been pleased to congratulate me, or to give me their opinion."

"Would you communicate a few of them to me? I should like to publish them in *La Nature*." "Very willingly, sir; I will send you my file to-morrow."

The following are a few of the notes that appear to me to give some new information in regard to singing stones:

Mr. Cartailhac, director of the Toulouse Museum, reports that three musical flints were once noticed by a missionary in the village of Chaffa, in the center of the plain of Thumazana, Abyssinia. These stones were hung by threads from a horizontal wooden rod, and were used for calling the faithful to prayers or to battle. They were struck with another flint, and their sounds, which were very intense, were heard from some distance.

In an interesting letter to Mr. Baudre from Mr. J. Ellis, member of the Royal Society of London, this learned scientist treats of the sonorousness of singing stones. "We know not up to the present," says he, "whether the sonorousness is affected by the form, bulk, chemical mass, or molecular constitution. It is very probable that these stones have internal structures that differ from each other—the sound of the stones being different when they are struck in two neighboring places. I should not be surprised if there were a sort of obliqueness in the structure, which would explain the impossibility of preserving the sound when a singing stone is cut or broken.

"There is here an interruption of the sonorous waves that are passing through the body. The great difference in the sounds that two bodies of nearly equal bulk are capable of producing is probably due to a difference in the arrangement of the molecule, which govern the mode of vibrating. I am sorry that I am unable to say more on this subject."

I reproduce a very pleasant letter from Mr. C. Sainte Claire Deville, of the Institute, the learned geologist, whom death robbed science of a few years ago:

"A feeling of remorse seizes me when I reflect upon the incalculable number of stones that I have broken—of flints broken in order to discover in them the traces of a shell, an echinus, or a polyp. And, when I consider all the sacrifices of this kind that my geological confreres are every day making, how many reasons have we not for thinking that we have destroyed specimens which might now be figuring among your sonorous keys! A vain search has been made for the mandrake that sings, but you have done better; you have found the stone that sings—you have discovered the singing soul of the stone! How many such souls, alas, have we sacrificed! You, on the contrary, less barbarous, instead of immolating them to a vain scientific curiosity, have approached them as a friend, have questioned them feelingly, and, when one out of a hundred thousand of them had the vocation, you offered it an asylum, opened the doors of your conservatory to it, and made a virtuoso of it! What superiority! And how much more crushing does such superiority become when we are obliged to recognize that your keyboard of stone offers a true paradox that geologists and physicists do not yet seem able to fully explain."

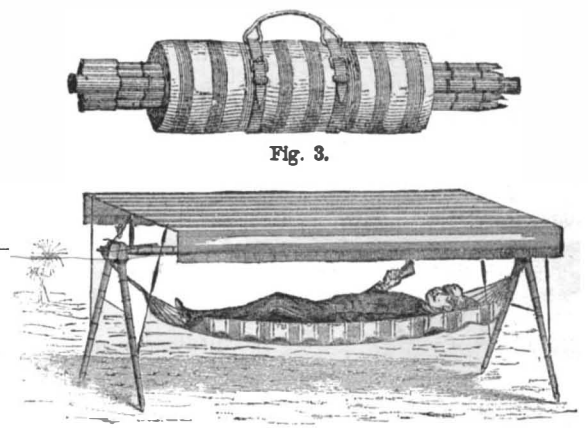


Fig. 3.

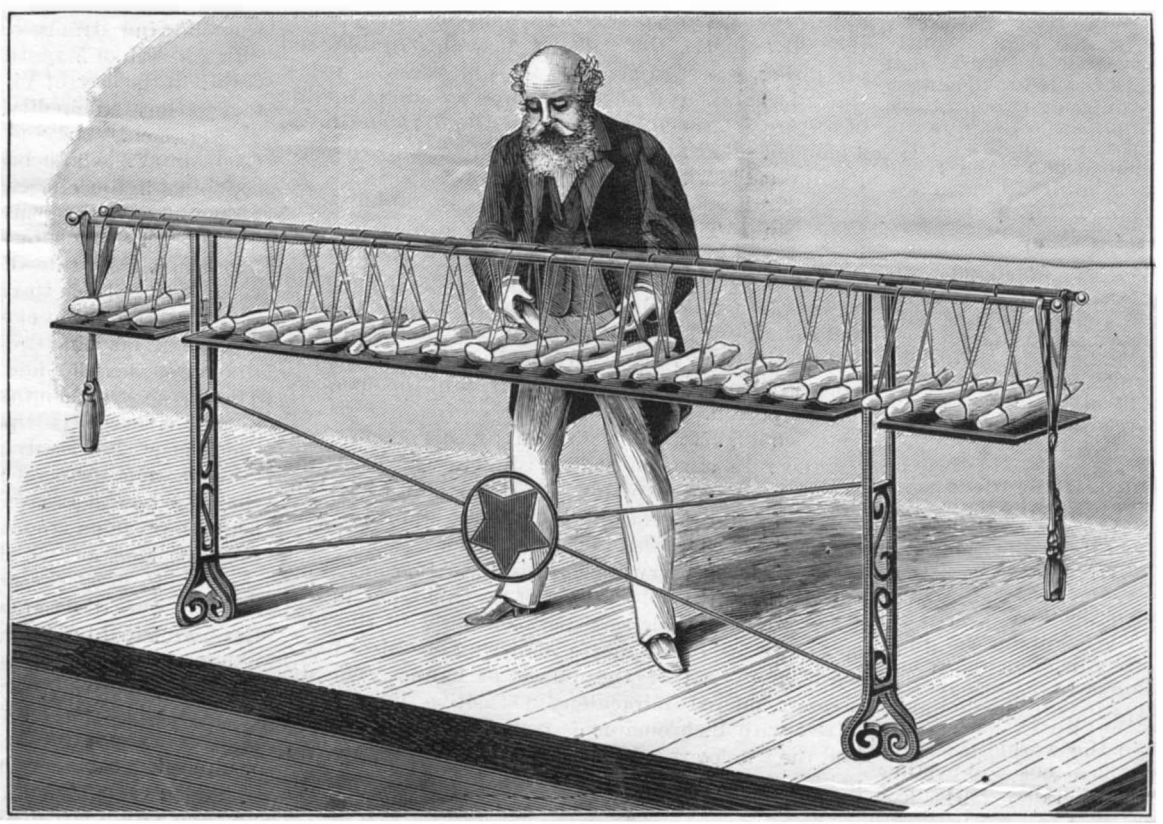
Fig. 1.—PORTABLE COVERED HAMMOCK.

Mr. Baudre calls his singing stones "prehistoric music." It is not impossible, in fact, that analogous keys were used by our ancestors of the Stone Age. This was Abbot Moigno's opinion.

"Who knows," says the old editor of *Cosmos*, "whether, in eagerly excavating in search of relics of the Stone Age, we shall not find a series of attuned flints? Why may not the flint, which was the first arm, the first tool, of prehistoric man, have also been his first musical instrument?"

Mr. Baudre thinks that the reason no musical instruments have been found in prehistoric strata is that searchers have not occupied themselves with native flints, but only carved ones.

The following are some of the peculiarities of these attuned stones: The stone that emits the greatest tone weighs 4½ pounds, while the one that gives the half tone of this weighs 9. This large flint is immediately followed by one of one ounce, that finds its similar in weight only at the end of the series, although the difference in sound is considerable. A 3 ounce stone gives exactly the same note as another that weighs but 6,000 grains. It will be seen that we have surprising anomalies here to puzzle physicists.—*G. Tissandier, in La Nature.*



BAUDRE'S SILEX PIANO.

Holyoke claims the honor of being the first town in Massachusetts to introduce electric light.

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Ourselves as Others See Us.

The following notices, appearing in newspapers printed in places remote from each other, represent a small proportion of the approving comment with which our contemporaries welcome the weekly receipt of the successive issues of the SCIENTIFIC AMERICAN. To those of our readers who have been with us for a generation or more, of which our subscription lists show large numbers, the reprinting of such comments may seem superfluous; but the young are all the time coming forward to fill places on life's stage, and with them such words may aid an introduction to a life acquaintance. If it would be in good taste we might, likewise, quote from the many good things patentees say of us, in their correspondence, relative to our methods of doing this class of business—in preparing their applications, and our success in taking care of their cases before the Patent Office—but the confidential nature of such services precludes reference thereto.

The Streator (Ill.) *Monitor* says: The SCIENTIFIC AMERICAN is one of the papers which are necessary to every one who expects to keep up with the times. To be deprived of this journal after once getting accustomed to receiving it, is like moving to a country where science and invention are unknown. It keeps its readers posted on all things appertaining to the mechanic arts, new discoveries, and appliances in science, and the problems and theories receiving the attention of the foremost workers in the fields of discovery. It is published weekly at $3.20 per year, and is worth to every intelligent person many times the cost.

The SCIENTIFIC AMERICAN is without a peer in its realm, says *The Capital*, published at Frankfort, Ky. It is not only a journal of arts, sciences, and mechanics, but it is the greatest of all journals of that class. Its pages are weekly filled with the most entertaining as well as the most instructive of matter, relating not only to really scientific matters, but to subjects that are intimately connected with everyday life. No family able to pay for it should be without this remarkable weekly.

The Dallas (Texas) *Machine Journal* says: The SCIENTIFIC AMERICAN, in our judgment, is indispensable to those operating machinery, as the valuable information contained in its columns if heeded would prevent many mishaps, and errors committed by ignorant applications in and about a plant of machinery. We notice in every number sufficient mechanical information to pay for its year's subscription. Operators of machinery dispense with a good and reliable assistant in not taking the SCIENTIFIC AMERICAN regularly.

THE SCIENTIFIC AMERICAN.—An examination of this paper, says *The Methodist Protestant* (Baltimore), will satisfy any person that it should find a place not only with every engineer and mechanic, but with every citizen of average intelligence, so varied and interesting are its contributions and illustrations. While it makes special record of new inventions, it covers the whole field of theoretical and applied science in all its departments. It is one of few of our exchanges we uniformly read through.

TRASH READING.—How deplorable the fact people spend precious time and money for trashy literature in this age of progress! If one-tenth part, says *The Mineral Wells Pilot* (Texas), was spent for such publications as the SCIENTIFIC AMERICAN that is spent and wasted for trash literature, ignorance and poverty would almost be banished from this fair land of liberty in a few years. Every number of the SCIENTIFIC AMERICAN contains 16 pages, beautifully printed and elegantly illustrated; it shows the progress of the world, and abounds with fresh, interesting subjects for all classes. No intelligent person, after reading it two or three months, would miss one single number for the subscription price, $3.20 per annum. We mention it with the hope of turning the minds of some of our readers from poisonous, fictitious, trashy, and unprofitable literature to something ennobling, full of knowledge, and elevating in its tendency.

The Wesleyan *Christian Advocate* says: That old established and popular journal, the SCIENTIFIC AMERICAN, published by Munn & Co., New York, maintains with increasing interest and usefulness its high character for art and science. Those interested in the mechanic and manufacturing arts, and inventions, and discoveries in science, cannot well do without it. It seeks specially to popularize knowledge and science, and it does this needed work in such a plain and interesting way as to adapt it to the easy comprehension of the masses of readers, as well as the savants and scientists of the whole country. We cordially recommend it to all who desire useful knowledge and practical information upon every day topics and subjects of invention, education, and progress. Price, $3.20 a year.

The Messenger, published at Minneapolis, Kan., suggests that if a person wishes to know about the great improvements that are continually being made in machinery, and learn of those things that the inventive mind of the American is bringing to light, he should be a subscriber of the SCIENTIFIC AMERICAN, one of the best periodicals of that kind in the world—beautiful cuts, clear print, good paper, and most interesting reading. One who takes the SCIENTIFIC AMERICAN once will always remain a subscriber.

The Republican, published at St. Clair, Mich., says: Of all the scientific papers published in this country, there is none which for the ordinary reader in any way compares favorably with the SCIENTIFIC AMERICAN. In fact, although a professedly scientific paper, its articles are so thoroughly free from all technical words and expressions that they are as well adapted to the general reader as to the pure scientist. It is a paper which no one can afford to be without who desires to keep posted in regard to the great progress which is now being made in the scientific world, because it contains a complete record of this progress expressed in the most interesting way. One of its best features is its illustrations, which represent the highest attainment in the line of artistic engraving. We believe there is no paper which is capable of exerting a more healthful influence upon children, first, because the illustrations are attractive and the description of scientific discoveries entertaining, and, second, because for the most part they relate to and tend to interest the reader in subjects which are of a practical character.

Photography Thirty Years Ago and To-day.

Referring to the progress the amateur photographer is making in England, *The British and Colonial Printer* tells us that not only the Princess of Wales, but other members of the royal family, have become familiar with the camera. The same paper draws a contrast between the present and earlier modes of posing the sitter, and the process of taking pictures and the improvements made in all departments of the photographic art, which the older readers of the SCIENTIFIC AMERICAN will recognize as truthful, and all admit to be amusing.

The torture to the sitter of old was something very real. If the fussy "artist" would only have permitted his victim to sit as he sat at home, there would have been little to complain of. Evidently, however, there was one look for everyday life and another for the "studio." The man who never opened a book from one year's end to the other stood bolt upright, close by a marble column, with his finger inside a copy of "Locke on the Human Understanding." The mother of a family, in terror lest her heated face should "come out frightful," or agonized by the amblings of a fly across her nose, sat glaring at a spot on the wall, her countenance rigid with a wooden smile only seen in photographs, while the man of science waited, watch in hand, for the fatal moment when the cap was to descend, and all was over. People dressed to be photographed, and dressed, especially in the humbler walks of life, so fearfully unlike nature, that when their "doppelgangers" appeared in the photographer's case, it was regarded by their acquaintances as a sign of superior acuteness to recognize the prototype. The blacksmith, with whom half the country side were familiar in his leather apron and his shirt sleeves, looked extremely stiff and unhappy as he stood by the regulation marble pillar—of painted fir—in his Sunday clothes, with his forefinger in the property copy of Mr. Locke's erudite treatise.

The photographer of the old school fixed the person to be *taken* in front of a bull's eye, and requested him to look "as he usually did." Then—with a view to secure this end—an implement of torture called a "head rest" was fixed on his occiput, evidently under the impression that this curve of iron was the usual appendage of an arm chair. A second or two later, the artist declared with well feigned resignation that he must "pose you again," and posing in his vocabulary always meant pulling down your shirt cuffs, laying your right hand in an unnatural position over a shaky little table, propping up a lock of your hair to make it resemble the typical portrait of Byron. Then after one or two final pulls and pushes, and easings of the bust backward and forward and sideways, as sculptors manipulate their clay models, the "sitter," heated, irritable, and perspiring, was requested to "look pleasant." At last the cap was taken off, the watch produced, and a minute of torture, it seemed hours, inflicted on the man who, in a moment of good nature and ambition, resolved to "be taken." The result we all know.

A portrait taken in a dentist's chair would have been as pleasing. The only satisfaction a cynic got out of the business was that the fellow with the lens did not get off scot-free. Before he poured the collodion on the plate which had to be so laboriously cleaned, and then dipped it in the mysterious bath, and retreated into the dark room with it, and dipped it again, he generally managed to leave some trace of the operation on his person. A photographer of the wet process times could always be known by his fingers. As for the rare amateur, this rash man, at least during the early stages of his novitiate, had to seclude himself from society, as his hands were stained beyond the power of chemicals to cleanse them.

All this is now very ancient history. It seems as out of date to hear people talking of the collodion process as it is to read of Niepce experimenting with the bitumen of Judea, or Daguerre rendering his silver plates sensitive by aid of the power of iodine. The dry plates rendered miraculously sensitive by gelatine mixed with bichromate of potash have revolutionized the whole art. It is no longer photography, but photoglyphy. A supply of plates is bought from the dealer ready for use, without the operator requiring to touch them, and, indeed, so sensitive that if touched they are injured, and if exposed to the faintest ray of light they are spoiled. Then, at the fitting moment, one is slipped into the camera, a little catch is raised, a click is heard, and quick as the twinkling of an eye a view is secured. There is no trouble; scarcely any mechanical skill is exercised. Practically, the operation is instantaneous, since a passing train, a galloping horse, or a bird in flight can be pictorially fixed.

They are becoming almost as indispensable a part of the tourist's kit as his guide book. The explorer no longer requires to paint the scenes, or the ruins, or the savages he visits, as Bruce did so laboriously, and at such a tremendous cost of priceless time. A dry plate, a click, and in two minutes there is secured a view, the accuracy of which even the skeptic regarding traveler's tales cannot dispute. It is in truth hard for any one to escape the modern photographer. There is apparatus as small as an opera glass and shaped quite like one. The size of the picture taken is immaterial. It can be enlarged to any extent. A manuscript can be copied as easily as the building in which it is preserved, or the librarian who so cautiously uncovers it can be "taken." This, indeed, is the present condition of affairs. But now that the Princess has become a "photographrix," we may expect to see a portable camera in every carriage, on the front of every tricycle, or even on the pommel of many a saddle.

Treatment of Rattlesnake Poisoning.

On the 11th of May, my little boy (aged eight years) while playing near the house, was bitten on the great toe by a rattlesnake. I saw him within a few minutes, ligated his ankle, and applied the following freely:

℞. Potash iodide.....gr. xv.
Iodine.....gr. xxx.
Aqua pura.....℥j. M.

Although the swelling was controlled, he suffered intensely from 5 P.M., the time he was bitten, until 10 P.M., when he became quiet and slept for two hours, when he awoke suddenly, screaming, starting about wildly, and complaining of excruciating pain in his limbs and jaws. I commenced giving him the tinctures of gelseminum and lobelia (two parts of the first to one of the latter) in half teaspoonful doses every five minutes, which was kept up for an hour before any effects were visible; relaxation having been obtained, all the tetanic symptoms subsided, and the cure was complete.

I was once called to a case where a large rattlesnake had bitten a little boy on the inside of the ankle—a very bad bite. I used the above prescription freely, and with like results as before. So far as the swelling was concerned, and by the early use of gelseminum and lobelia, cure was effected in five hours, *i. e.*, the active symptoms were subdued within that time, requiring no further professional attention. The iodine and iodide of potash have gained a great reputation in this country as an antidote to the poison of the rattlesnake, and is used when needed with the same results on cattle and horses as on man.

In the case of my little boy, I am satisfied that if I had given him freely of gelseminum and lobelia until it relaxed him, the trouble would have been at an end; indeed, I proved it on the case I had since, and hereafter I shall think of no other treatment, unless it should fail me.—*J. W. Holmes, M.D., in Medical Summary.*

Violation of a Tomb after Six Hundred Years.

The *Stampa*, a prominent Italian liberal journal, tells the following strange story: On the night between the 19th and 20th of May, the old church of Sta. Maria de' Gradi, in the city of Viterbo, was entered by the secretary to the municipality, the city engineer, and a band of workmen. They proceeded to the tomb of Pope Clement IV., whose body had lain in a marble sarcophagus in the church since his death in 1268. The sarcophagus was opened, and an inner coffin of wood was found. Upon opening this they found the remains in a fair state of preservation, and clad in the vestments suitable to the papal rank. They did not touch anything, but closed both coffin and sarcophagus. Next morning they returned, accompanied by the sindico of the city and the sub-prefect of the district. The corpse was then taken out of the coffin; the ring, in which there was a precious stone, was taken from the finger; the richly embroidered silk gloves and sandals were torn off; the agraffe which fastened the cope on the breast, and which was richly mounted with precious stones, was cut out; and those portions of the cope, which was of gorgeous workmanship and in good preservation, were cut away. The remains were then huddled into a box and sent off to the municipal buildings; the articles that had been removed were, according to the sindico, to be placed in the museum of Viterbo. The *Stampa* observes that if a poor man's grave were thus violated, the law would give some months' imprisonment to the criminals. Will not the same measure be given to the disturbers of a Pope's tomb which is one of Italy's historic monuments? And it calls on all the newspapers of the peninsula to publish the outrage, and bring public opinion to demand the punishment of the principals, whoever they may be.

MESSRS. GEO. H. HULL & CO., of Louisville, Ky., are supplying what they term Dresden sand, which is of such quality that the fine iron castings are made without facing, either in the sand or mould. Foundrymen will appreciate the value of the new sand.

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THE IGUANA AND HOW IT IS CAUGHT.

BY DANIEL C. BEARD.

One can scarcely imagine a more terrible looking creature than a full grown iguana. Instead of being discouraged, however, by its looks the animal seems to delight in its ugliness, and to a great extent rely upon its formidable appearance for protection. When alarmed, it will puff itself up, erect the spine upon its back, and expect by this means to frighten away its enemies; and if its harmless nature were not well known it would seldom be molested, but might bask in the sun for centuries to come, instead of becoming a comparative rarity by gradual extermination.

The common iguana (*I. tuberculata*, Lan.) is from three to five and even six feet long when full grown. It inhabits the West Indies and tropical America, and belongs to an exceedingly numerous family of lizards. As a rule, all of these relatives have broad, flat heads, often ornamented with comb-like ridges or membranous lobes; similar appendages usually continue along the dorsal region. The throat is almost invariably furnished with a dewlap or membranous expansion of some kind. Their eyes are always furnished with lids which may be completely closed; their tongues are short, thick, and only free at the end, and their ears are freely exposed.

The iguanidæ are an ancient race, but the modern representatives may be divided into two great groups, based upon the character of their teeth.

In the American species, or true iguana, there is a deep furrow in all the jaws. The teeth are curiously flattened and toothed, and are attached to the inner surface of the jaw bone.

In the Old World species, comprising the sub-family of agamidæ, the teeth always grow upon the edge of the jaw.

Although the common iguana cannot, with propriety, be termed an aquatic lizard, it displays no fear of the water, but will ofttimes escape from pursuers by taking to the water and swimming rapidly away, with its fore feet held, after the manner of a frog, motionless along its sides, and propelling itself by a serpentine movement of its long tail, or, diving, will remain under water until its enemies abandon the chase. According to Wood, the iguana has been known to remain under water for an hour at a time, and at the end of that period to emerge in perfect vigor.

The female iguana will lay from four to six dozen eggs, which are hatched by the heat of the sun, in the same manner as turtles.

It is almost incredible that the meat of this repulsive reptile is used as an article of food by the inhabitants of the country in which it is found. Not only is this so, but it is, further, considered a great delicacy.

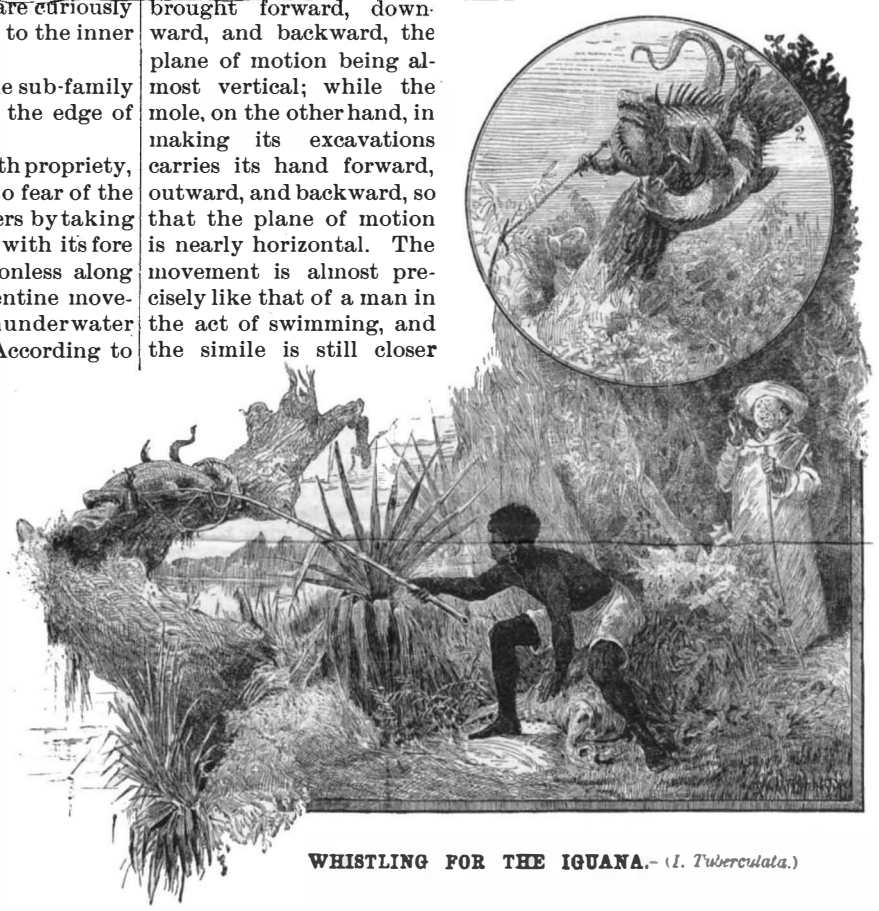
The eggs of this animal are also in as high repute as its meat, although both are said to disagree with some persons. The iguanas are vegetarians, their food consisting, as far as is known, of fruit and other vegetable substances.

There can be little doubt that the white population of tropical America learned to eat the flesh of the iguana from the ancient Indians. In Mr. Bryan Edwards' "History of the West Indies," published some hundred years ago, he says: "I believe it seldom happens that they (the iguana) were served at any English table, but their French and Spanish neighbors still devour them with exquisite relish."

Mr. Edwards also says that he has been "assured by a lady of *great beauty and elegance*, who spoke from experience, that the iguana is equal in flavor and wholesomeness to the finest green turtle."

The old time priests evidently enjoyed the flesh of this lizard as well as the sport of its capture, if we may judge from the following extract from the writings of Father Labat, which appeared in the *Sporting Magazine* for September, 1794:

"We were attended," says he, "by a negro, who carried a long rod, at one end of which was a piece of whip cord with a running knot. After beating the bushes some time, the negro discovered our game basking in the sun, on a dry limb of a tree; hereupon he began whistling with all his might, to which the *iguana* was wonderfully attentive, stretching out his head and turning his neck, as if to enjoy it more fully. The negro now approached, still whistling, and, advancing his rod gently, began tickling with the end of it the sides and throat of the iguana, who seemed mightily pleased with the operation, for he turned on his back and stretched himself out like a cat before a fire, and at length fairly fell asleep; which the negro perceiving, dexterously slipt the noose over his head, and with a jerk brought him to the ground. Good sport it afforded (continues the reverend historian) to see the creature swell like a turkey cock at finding himself entrapped. We caught others in the same way, and kept one of them alive seven or eight days, *but it grieved me to the heart that he thereby lost much delicious fat.*"



WHISTLING FOR THE IGUANA.—(*I. Tuberculata.*)

Structure of the Mole.

Doctor Merriam, in his work on the mammals of the Adirondack region, describes the mole and its remarkable construction for digging, and says: "The modification of structure that adapts this animal to its peculiar mode of life affords a most remarkable example of animal specialization. The conical head, terminating in a flexible cartilaginous snout, and unencumbered with external ears or eyes to catch the dirt, constitutes an effective wedge in forcing its way through narrow apertures; the broad and powerful hands, whose fingers are united nearly to their very tips and armed with long and stout claws, supply the means by which the motive power is applied, and serve to force the earth away laterally to admit the wedge-like head; while the apparent absence of neck, due to the enormous development of muscles in connection with the shoulder girdle, the retention of the entire arm and forearm within the skin, the short and compact body, and the covering of soft, short, and glossy fur tend to decrease to a minimum the frictional resistance against the solid medium through which it moves. In fact, it presents a most extraordinary model of a machine adapted for rapid and continued progress through the earth.

"The mole does not, and cannot, dig a hole in the same sense as other mammals that engage in this occupation, either in the construction of burrows or in the pursuit of prey. When a fox or a woodchuck digs into the ground, the anterior extremities are brought forward, downward, and backward, the plane of motion being almost vertical; while the mole, on the other hand, in making its excavations carries its hand forward, outward, and backward, so that the plane of motion is nearly horizontal. The movement is almost precisely like that of a man in the act of swimming, and the simile is still closer from the fact that the mole brings the backs of his hands together in carrying them forward, always keeping the palmar surface outward and the thumbs below. Indeed, when taken from the earth and placed upon a hard floor, it does not tread upon the palmar aspect of its forefeet as other animals do, but runs along on the sides of its thumbs, with the broad hands turned up edgewise."

The Great Glacier of Alaska.

According to the *San Francisco Courier*, the great glacier of Alaska is moving at the rate of a quarter of a mile per annum. The front presents a wall of ice 500 feet in thickness; its breadth varies from three to ten miles, and its length is about 150 miles. Almost every quarter of an hour hundreds of tons of ice in large blocks fall into the sea, which they agitate in the most violent manner. The waves are said to be such that toss about the largest vessels which approach the glacier as if they were small boats. The ice is extremely pure and dazzling to the eye; it has tints of the lightest blue as well as of the deepest indigo. The top is very rough and broken, forming small hills, and even chains of mountains in miniature. This immense mass of ice, said to be more than an average of a thousand feet thick, advances daily toward the sea.

The Oregon.

The Cunard steamer Oregon, which is now armed as a swift cruiser, was the flagship of Admiral Hoskins during the recent maneuvers of British war ships in Bantry Bay. Besides her ten guns—four Vavasseurs and six muzzle loading sixty-four pounders—the Oregon has eight steam launches of high speed, capable of being effectively used as torpedo boats. She will also receive several Gatling guns.

Influence of Mechanical Invention.

In a recent issue of *Bradstreet's* the subject of "Progress in Manufacturing" is touched upon, and it is shown by reference to researches of Mr. Edward Atkinson to what extent the world is indebted to mechanical invention for the great abundance of useful commodities. The result is shown in a clear manner by the aid of charts. For the purpose of illustrating his argument or theory, Mr. Atkinson selected, among other industries, the manufacture of cotton sheetings, comparing the prices and other figures of 1840 with those of 1883 and 1885. The data were obtained from two mills which have always been successful.

In 1840 the product of cotton sheetings per hand per year was 9,600 yards, while in 1883 it was 28,032 yards, an absolute increase of 190 per cent in efficiency of labor growing out of improvements in machinery.

In 1840 the number of spindles was 12,500; in 1883 it has increased to 30,800, an *increase* of 146 per cent.

The value of product per hand in 1840 was $868; in 1883 it was $1,973, an *increase* of 127 per cent.

The rate of wages per hour in 1840 was 4·49 cents. In 1883 it was 8·80 cents, an *increase* of 96 per cent.

The rate of wages per year was $175 in 1840, and in 1883, $287, an increase of 64 per cent.

The number of operatives in 1840 was 530, in 1883, 527; remaining about the same, while the increase in machinery was about 186 per cent.

The hours of labor were 13 in 1840 and 11 in 1883, being a *reduction* of about 15 per cent. In 1840 the price of cloth was about 9 cents, while in 1883 it had been reduced to about 7 cents, being a reduction of about 22 per cent.

Estimating the proportion of price to profit on fixed investment at 10 per cent, the profits in 1840 were 1·18 cents, in 1883, 0·43 cent, being a decrease of 80 per cent in the proportion of the product assigned to profit.

Mr. Atkinson has summarized the progress as follows:

"Fifty years ago the average earnings of all the operatives in a large cotton mill, who were worked thirteen hours or more a day, and among whom were comprised a much larger proportion of men than at the present time, while the women were older and there were fewer children, were $2.50 and $2.62 per week. The quantity of machinery which each hand could tend was much less; the production of each spindle and loom was less; the cost in money of the mills per spindle or loom was much greater, while the price of cloth was at times more than double the price at which it can now be sold with a reasonable profit. The average earnings of all the female operatives in what purports to be the same factory, at the present time, on the same fabric, working ten or eleven hours a day, are $5 per week, and in some cases even $6 or more to the most skillful. That is to say, women now earn about twice as much in ten hours as men and women combined averaged in thirteen hours then. The course of events has been as follows: A continuous reduction in the hours of labor, coupled with an increase in the earnings per hour; a diminution in the ratio of capital to production, coupled with an increase in its productive efficiency; a constant increase in the supply of cotton fabrics per capita, coupled with a decrease in the price; a continuous increase in the purchasing power of gold dollars in respect to almost all articles of necessary subsistence."

It is pointed out that these facts afford a complete demonstration of the fallacy that high wages and high cost of production are synonymous; that the rate of wages is only one of many elements instead of the single important element in determining the cost of production in any industry; that it is quite possible that the highly paid labor in our best cotton mills costs less per pound or yard of product than the "pauper labor" in English mills, and that if the obstacle of obstructive tariff taxes on sundry things which they have to use were cleared away, American manufacturers would be more than able to hold their own.

STATE regulations as to the use of automatic car couplers are likely to give considerable trouble in the matter of exchanging cars in order to make through lines. The laws of one State cannot control the kind of couplings used by the railroad company of another State whose lines do not enter the State where couplings are regulated by law. The cars of such a company might be excluded altogether from the State, but that would interfere with facility of traffic and be a rather costly remedy. Unless all the railroads adopt safety couplers, and unless those adopted work together, one or two or even half a dozen States can do but little by legislation to bring about the desired reform. This is a matter that the railroads should attend to themselves, without waiting for outside pressure.

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ENGINEERING INVENTIONS.

A rotary engine has been patented by Mr. Frederick H. Crass, of Murfreesborough, Tenn. This invention consists in a peculiar construction and arrangement of a revolving outer casing bearing piston and exhaust ports, combined with a stationary steam chamber and cut-off gates or slides.

A sand feeder for locomotives has been patented by Mr. Hampton R. Campfield, of Susquehanna, Pa. Combined with the sand box and its discharge pipe is a feed box, with a handhole, so arranged that the sand will be delivered regularly and in uniform quantities, and so that pebbles, coarse sand, or refuse will not be liable to clog the outlet groove.

AGRICULTURAL INVENTIONS.

A cornstalk cutter has been patented by Mr. George A. Stone, of Richmond, Mo. Combined with a frame are pivoted levers carrying pivoted chopper bars, with other novel features, making a machine which, as drawn along a row of stalks, will cut them into short lengths, which may be readily plowed under; the machine can also be made narrow to cut a single row of stalks, or wider to cut two rows of stalks at a time.

A thrashing machine has been patented by Mr. Thomas J. Widemire, of Grampian Hills, Pa. It is for thrashing grain in such manner that the straw will not be ruined or broken any more than it is by hand thrashing, the grain to be thrashed being placed upon a table of the machine, and beaten by flails, which after striking it slide off, are carried around by a wheel, then strike again, and so on.

MISCELLANEOUS INVENTIONS.

A ribbon and braid holder has been patented by Mr. Charles M. Stone, of Belton, Texas. This invention consists of a peculiar shaped wire holder easily adjusting itself to the diameter of the roll and ribbon thereon, so the ribbon may be wound smoothly and evenly, and the end will be held to prevent unwinding.

A device for fitting cross cut saws has been patented by Mr. William H. Dessureau, of Otsego Lake, Mich. It is a combination tool, adapted also for use as a screw driver, measure, and hammer, and by which, in connection with a file, a saw can be easily and accurately fitted.

A surgical instrument has been patented by Mr. John S. Poynor, of Walnut Springs, Texas. In a headed rod a series of springs is held with their inner ends to turn in such a way as to make an improved device for extracting foreign bodies from different parts of the body, and one which can also be used as a probe.

A tag or label has been patented by Mr. Samuel M. Guss, of Reading, Pa. It has a pin secured by a button, the eye passed through the label, with a washer and guard for the point of the pin, making a tag which can be readily carried in the pocket, and, with suitable printing matter, will be convenient to attach to goods, secured seats, etc.

A clasp has been patented by Messrs. Charles F. and William J. Walters, of Prospect, N. Y. It is formed of two flat jaws made integral with a cross-piece uniting them combined with a latch pivoted on one jaw and having a curved slot through which a pin passes from the other jaw, making a device for holding stockings, shirt sleeves, or parts of garments.

A nail tongs has been patented by Mr. Woodson Mosley, of Kingsland, Ark. A pair of pivoted hand tongs has a hook secured to the under side of one of the levers for retaining the handle of a scoop, so that a greater quantity of nails can thus be removed at a time from nail boxes or nail trays and the dropping of the nails prevented.

An end gate fastening has been patented by Mr. Duncan W. McKinnon, of North Sydney, Nova Scotia, Canada. Combined with the gate is a rod or shaft with lateral hooks engaging with the braces on the sides of the wagon body, the shaft having a lug acted on by a spring of the gate, making a simple and strong fastening for the end gates of wagon boxes.

A cuff button has been patented by Mr. Elias M. Stewart, of Richmond, Canada. Combined with a hollow head having a tubular shank with a cross piece, a pin is arranged to turn in the shank, with a cross piece on the pin, a sliding rod through the upper end of the pin, and a head on the outer end of the rod, the head having a rib for locking the rod in place.

A milk and water cooler has been patented by Mr. Edward Williams, of Lynn, Mass. It consists of a can with two compartments, separate faucets and covers, with handles and trunnions on the outer side of the can, making a can in which the ice employed for cooling is not brought in contact with the liquid to be cooled.

A water motor has been patented by Mr. Horace L. Walker, of Ottumwa, Iowa. It works in connection with an overshot water wheel, combined with which is a series of double acting pumps, which rotate with it, there being weights attached to levers for working the pumps, and cranks connected to the pump pistons and to the levers.

A vehicle wheel has been patented by Mr. Charles W. Long, of Eaton, O. Combined with a circular rim is a frame mounted to turn within it, making a wheel without a hub, which can be used as a master wheel on reapers or for other purposes, making the reapers run more easily, the draught less, and giving more power.

A fence post has been patented by Mr. William H. Gates, of Jesup, Iowa. The invention consists in particular constructions of the posts, combining therewith base plates or ground anchors of peculiar form, and in the connections of the horizontal fence wires or rails with the fence posts, to facilitate the erection and lessen the cost of such structures.

A ladder has been patented by Mr. Robert Furlong, of Saucelito, Cal. It is for house or orchard use, and is adapted to support a platform when desired, the invention consisting in the combination, with two pairs of bars pivoted at or near their middles, of rungs uniting one pair of bars and cross bars, and braces uniting the other pair.

A jointed gas and lamp bracket has been patented by Mr. Henry P. Drew, of New York city. Combined with chains and swinging arms of a bracket are an adjustable guide bar and stops, so the swing of the outer arm will be limited independently of the position of the inner arm, the invention being an improvement on former patented inventions of the same inventor.

A sash holder has been patented by Mr. William D. Isett, of Altoona, Pa. Combined with a frame are two friction disks mounted independently and eccentrically on a shaft, with cords and pulleys for turning them, making a device for locking sashes so they cannot be raised or lowered from the inside or outside, the device being readily manipulated from the floor of the room.

A strap holder has been patented by Mr. Robert L. Beaumont, of St. Joseph, Mo. It is formed of two sections hinged together at one side, and having catches on their opposite edges, there being also a hinge or joint wire having snap hooks formed on its edges, the device being for holding a strap, cord, or chain when not in use, or as a grip or handle for packages or bundles.

Drafts, checks, and other money orders form the subject of a patent issued to Mr. William T. Doremus, of Flatbush, N. Y. It is made with spaces for the place, date, and name of drawer, order and name of payee, dollar sign, numerals from 0 to 9, fraction signs, etc., so that such checks, when filled out, will necessitate too many erasures and changes to be successfully "raised."

Neckwear forms the subject of a patent issued to Mr. Edwin D. Smith, of New York city. This invention consists in an embossed scarf, bow, or cravat, made of paper, with devices for holding it in place on the collar button, the goods being capable of being produced in black or colors in imitation of silk, calico, or other fabrics, and so as to simulate the creases and folds of a variety of materials.

A fire escape has been patented by Mr. Isaac S. Smeltzer, of Columbus, Ohio. Two grooved pulleys are mounted on a shaft journaled in brackets projecting from the wall of a building, persons to be rescued may take hold of rungs and step on platforms, which will descend while other parts of a cable are rising, or firemen and hose can also be elevated to the upper stories of a building.

A hedge trimmer has been patented by Mr. William McLaughlin, of Auckland, New Zealand. It is made with a carriage and a disk having two or more cutters, connected with the drive wheel of the carriage by two pairs of beveled gear wheels and two shafts, whereby the disk will be driven at great speed by the advance of the machine, making a mechanism adapted for cutting brush and trimming hedges.

A hat and bonnet fastener has been patented by Mr. James L. Umbellar, of Kankakee, Ill. It consists of a hook or combined hook and elastic cord fastening, designed as a substitute for the ordinary cords or bands usually sewed on ladies' hats and bonnets, making a fastening which is conveniently attached, may be readily renewed, and is adjustable to secure a good fit and hold without sewing on the hat or bonnet.

A door bolt has been patented by Mr. John F. Taylor, of West Park, N. Y. It is made with a bar adapted to slide and be turned axially, and with a cam or eccentric lug, and held to the door so its lug may enter a recess for holding the bar, so that the door will be held closely to its casing or seat without regard to variations in size of door or casing caused by changes in temperature or the weather.

An apparatus for purifying water has been patented by Mr. Robert H. Thurston, of Hoboken, N. J. By this invention air or purifying gas is introduced under pressure into the rising main or delivery side of a pumping system, for aerating the water supply, for oxidizing all substances that are oxidizable, and thus purifying the water supply of cities and towns that are supplied with water under a head or pressure.

A stop attachment for roller skates has been patented by Mr. Josiah P. Geran, of Brooklyn, N. Y. It is made with a curved plate having strengthening flanges, a recess, and a flexible block secured in the recess of the curved plate by a clamping plate, making a device by which the advance of skaters can be readily checked, and which will serve as a safeguard to prevent the skater from falling backward.

A wire rod rolling mill has been patented by Messrs. Henry Grey and Richard Bowater, of Beaver Falls, Pa. It is for reducing heated rods to prepare them to be drawn into wire, and provides a special construction and combination of parts to avoid the use of wabbler connections and of gearing between the rollers, as well as to afford means for supplemental heating of the wire rod during the process of rolling.

A life saving apparatus has been patented by Mr. Olney Arnold, of Pawtucket, R. I. Combined with a kite is a small boat, carrying a spool or bobbin with a life line, one end of which is made fast to the ship while the kite is made to drag the boat to the shore, the boat being so made as to adapt it to increased or diminished resistance in the water, and so it can be guided out of alignment with exact direction of the wind.

A nut lock has been patented by Mr. Louis Brandt, of Salina, O. Combined with a fish plate, a screw bolt and nut fitted thereon, and a projection forward of the face of the plate, is a block fitted to an angle of the nut and filling the space between the nut and projection, with another screw nut so placed and weighted as to retain the block between the nut proper and the projection.

A slicer has been patented by Mr. Daniel J. Gilchrist, of Newark, N. J. Combined with a slide carrying a blade is a board held to the slide by links and an angle lever, a rod being connected with the angle lever by means of which the board can be moved a greater or less distance from the edge of the blade, and the device readily adjusted to cut slices of any desired thickness.

A wagon box fastener has been patented by Mr. John A. Jonas, of Reserve, Kan. Combined with a wagon box having bars with heads on the upper end of the inner surface is a false box with spring straps provided at their lower ends with hooks which can catch on the heads on the rods of the box, the spring fastener being tightened by the pressure of the load against the false box.

A two wheeled vehicle has been patented by Messrs. Joseph F. Sanders and Theophilus T. Whitcomb, of Elizabeth City, N. C. Bed plates are fixed at or near each end of the axle, having grooves forming seats for the shafts and the springs or their bed blocks, whereby the height of the shafts may be regulated, and a simple connection is made of the spring and shaft to the axle, making a device especially fitted for the running gear of two wheeled vehicles.

A washing machine has been patented by Mr. Peter Lawson, of Moline, Ill. A washing wheel journaled to revolve in a tub has on its periphery a series of eight-sided rubbing rollers, and against these is held by a board and frame, with a spring, a roller somewhat larger, between which and the smaller rollers the clothes are drawn or made to pass by the turning of a crank, giving a quick and thorough rubbing motion with little liability to a tearing action.

A combined burglar alarm and sash fastener has been patented by Mr. John Brady, of Philadelphia, Pa. A bar with bolt holes is attached to the front of the upper sash, and a toothed bar to the front of the lower sash, and a spring bolt is arranged in the window frame to move parallel to the sash and engage with the toothed bar, making a locking device as well as an alarm when the window is opened from the outside.

A tricycle has been patented by Messrs. Theodor R. A. Weber, of New York city, and Carl E. E. Hennig and Alfred E. Frommelt, of Paterson, N. J. The main wheels have sprocket wheels connected with sprocket wheels on the forward treadle shaft, in combination with sliding clutch blocks, there being two treadle shafts which work together, but so placed that the treadles of one will be horizontal while the other is vertical, with various other novel features.

A machine for straightening match splints has been patented by Mr. William H. Wyman, of Oshkosh, Wis. Combined with a partition shaker is a partition box held in the bottom of the same, whereby the splints are caused to turn and move until they drop lengthwise into compartments formed between the partitions, whereas heretofore the splints were straightened by the machine and then placed by hand in the box.

A vehicle wheel has been patented by Mr. William Gibby, of Rahway, N. J. The hub box has exterior screw threaded and tapered longitudinal grooves, the hub sections sliding upon the hub box and having radial slots in their outer parts to receive the spokes, etc., so that the wheels can be adjusted to cause vehicles to track wider or narrower, to tighten or slacken the rims, and allow part of the wheel only to be removed and replaced.

A button or stud has been patented by Messrs. Read Benedict, of New Brighton, and Harry M. Scott, of Brooklyn, N. Y. It has a twisted shank with attached plate, whereby the plate or bottom may be easily inserted into a button hole in a garment, the button shank and plate being formed together of a single piece of sheet metal bent into form to be soldered or otherwise secured to the bottom or under side of the button proper.

A shirt has been patented by Mr. Nathan Roggen and Toba Eisenstein, of New York city. The yokes extend from the back placket along the neck piece, thence directly over the shoulder seams, and they are each formed with side points, which follow down the shoulder seams front and back, to strengthen and re-enforce the shirt at the shoulder and prevent the seams from giving away from wear of the coat, vest, and suspenders.

A welding compound has been patented by Mr. Elisha Watkins, of Portland, Ore. It is made from sal ammoniac, zinc, borax, and iron filings, a specified proportion of each, and made according to certain directions, whereby it is claimed that perfect welds of iron and steel can be made at a low heat, with no risk of burning or from repeated heatings, while it is stated to be excellent for tempering and toughening.

A combined door check and buffer has been patented by Carrie G. Griffin, of Manhattan, Kan. The door check, with a pivoted hook, has a bumper with a pivoted latch or tumbler for engaging the hook, the tumbler being adapted to be turned in one direction to engage the hook, and to allow the hook to pass when turned in the opposite direction, so it may be attached to a door or wall and used either as a bumper or to keep the door open.

The setting of real and artificial stones forms the subject of a patent issued to Johann F. Mahla, of Pforzheim, Germany. The setting consists of a metal ring or piece in which hollow heads are formed, terminating in hollow jaws or claws, the latter being drawn out of the metal by punches or stamps, instead of by hand as heretofore, the claws being hollow and much stronger and stiffer than solid ones.

A core for the armatures of dynamo electric machines has been patented by Mr. Hans J. Muller, of New York city. It is a formed of a single block of metal with a series of transverse ventilating apertures extending from side to side and dividing the central portion into transverse gridiron bars, the apertures between the bars having the same cross section from the outer surface of one side of the armature core to the outer surface of the opposite side, to prevent overheating of a Siemens armature.

A quilting attachment for sewing machines has been patented by Mr. David R. Fraley, of Lexington, N. C. This invention covers a special construction and combination of parts intended to hold quilts extended while traveling to and fro to carry them across the sewing machine, holding and stretching the upper and lower cloths independently, and providing a tension to hold the quilt down on the bed and feeder so that both bottom and top cloths will be held evenly with other novel features.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) T. H. W. J. desires (1) a paste to clean white leather belts (military), that will not rub off. A. If the belts are of a dull white, stale bread is the best preparation to use in cleaning them. If they have a gloss, use a sponge with tepid water. 2. What to clean white helmets with? A. As for the helmets, we know of no means by which they can be cleaned except by coating the soiled places with ordinary crayon chalk. A little pipe clay mixed with water would probably answer equally as well.

(2) X. Y. Z. desires a method of making paper tough and flexible. Also, can the tough paper used for flour sacks, etc., be made soft like leather or cloth without too great expense, by a chemical or a mechanical process? Is there any machine for taking out stiffness? A. The character of the paper depends largely upon the material with which it is made and also upon the amount of size worked into the mass. The "Technology of the Paper Trade" was the title of a series of articles published in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 109, 110, 116, 117, 118, and 123, and we would refer you to these.

(3) E. H. desires a recipe for a mucilage for adhering photographs to convex glasses, for painting what is called ivorytype. The mucilage must be perfectly transparent, and not contain either dextrine or starch, or any chemical that would stain the photograph. I want a mucilage that will not sour or mould, spot or crack, after applied to the photograph. A. This information is given very fully on page 120 of SCIENTIFIC AMERICAN, February 21, 1885, under title of "Practical Method of Transferring and Coloring Photographs on Glass." 2. Would like a recipe for a preparation to be applied to the surface of zinc to kill it or remove the gloss, so that when paint is applied it will adhere firmly and not chip off. A. Use dilute sulphuric acid.

(4) J. H. N. asks if there is any way of making phosphorus hold its luminous property on paper for a week or more. Also kindly state if you know of any magnetic iron ore being found in paying quantities in western New York, west and south of Rochester? A. We would recommend that luminous paint be substituted for the phosphorus compound. The luminous property of phosphorus is due to the slow oxidation of that element giving rise to an exceedingly poisonous gas; and if the phosphorus is in sufficiently large quantity, the oxidation will increase until it bursts into flame. The two principal deposits of magnetite in New York State are, 1, those of the Adirondack region and, 2, those located in the southeastern portion of the State. There are no worked deposits of importance in the region mentioned by you.

(5) L. S. asks (1) how to clarify rosin to render it either transparent or a nice white color. A. You can dissolve rosin in ether or benzol; filter the mixture, and allow the solvent to volatilize, and then you will have the rosin freed from mechanical impurities. 2. How to produce wax similar? A. Beeswax is bleached by exposure to sunlight in thin cakes. 3. If there is a compound cheap and good, white or transparent, fusing similar to rosin and setting hard and tough? A. Try paraffine. 4. How to treat moulds in which rosin is run so that it won't adhere to the mould? A. Covering the contact surfaces in the mould with pure glycerin is recommended.

(6) A. C. D. writes: The air saturated with vinegar fumes seems to destroy the strength of the lime in plaster, and it is constantly falling in dust and sand. I wish to use some ingredient in the mortar which will not be susceptible to a vinegar atmosphere, and make the wall permanent. A. Quicklime and linseed oil mixed stiffly together form a hard cement, resisting both heat and acids. A stiffly mixed paste of pipe clay and coal tar is also used. Coating the wall with waterglass or sodium silicate is excellent; the silicate will combine with the lime, and form a calcium silicate which is as hard as stone.

(7) W. H. writes: I have a large mirror, the back of which has from cause unknown to me become spotted, looks as if was smoked or rubbed; now, where can I have it repaired, or how can I do it myself? A. It may be necessary to resilver the entire mirror, but if the injured localities are not too extensive, the following plan will answer: Pour upon a sheet of tin foil about 3 drachms of quicksilver to the square foot of foil. Rub smartly with a piece of buckskin until the foil becomes brilliant; lay the glass upon a flat table, face downward; place the foil upon the damaged portion of the glass; lay a sheet of paper over the foil, and place upon it a block of wood or a piece of marble with a perfectly flat surface; put upon it sufficient weight to press it down tight; let it remain in this position a few hours. The foil will adhere to the glass.

(8) R. T.—The practice for sizes of safety valves varies somewhat to suit the trade sizes of pipe and fittings. One square inch opening in safety valve for each 5 horse power (nominal) is a fair average for stationary boilers. By Act of Congress, for cylindrical boilers, 24 square inches area is required for each 500 square feet of effective heating surface, for marine use. For obtaining the distance of the ball for a given pressure: Divide the weight of the ball by the area of the valve, and divide the required pressure by the quotient. The last quotient will be the distance of the center of the ball in parts of the distance of valve stem from the fulcrum. As in your case

$$\frac{\text{70 lb. weight}}{\text{7 sq. in. area}} \quad \frac{\text{90 pressure required}}{= \text{10 1st quotient}} =$$

9 times the length of the leverage; then 9x2¾ inches= 24¾ inches whole length of lever from fulcrum to center of ball. As 24¾ inches less 2¾ inches=22 inches, and as you do not give the weight of the lever and valve, we apprehend that 1 inch may be allowed for their weight, and that your safety valve is set for 90 pounds pressure.

(9) M. K. B.—The sputtering of molten metal is caused by dampness or water. If cast in a metal mould, heat the mould hotter than boiling water.

(10) E. C. asks how to cut off steam gauge glasses. A. Take a small round file, and break a small piece off the end to give it a sharp edge. Pass the end of the file into the tube, and press the sharp edge of the file on the glass at the place to be cut, turning the glass so as to cut entirely around it, when it will be found to break by a gentle pull. If the place to be cut cannot be reached in the first cut, make two cuts. Or you can make a slight cut all around with a file, putting a little turpentine previously over the place to be cut.

(11) A. G. S. asks whether it is possible to put iridium on edged tools so as to hold the edge for a longtime without getting dull; also, if it can be done, the address of any concern that can do it. A. Iridium pointed tools will not do to turn hard steel or even cast iron, as it is too brittle, but for pearl, bone, rubber, or celluloid it has been proved to do ten times the amount of work done with a steel tool before it becomes dull. The iridium pointed tool costs about three times that of a steel tool. The tools are made by the American Iridium Company, of Chicago, of which John Holland is manager.

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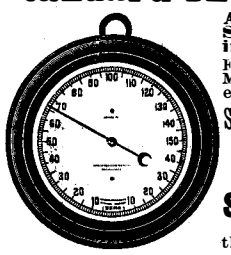

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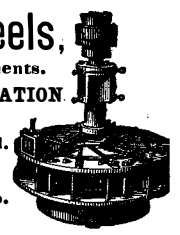

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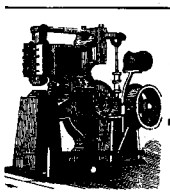

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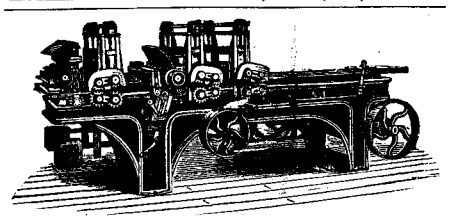

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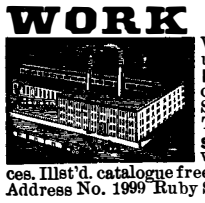

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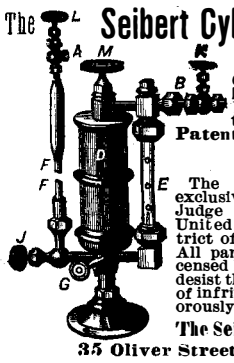

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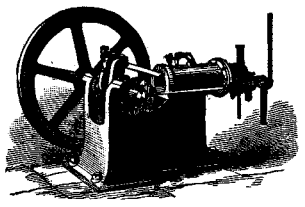

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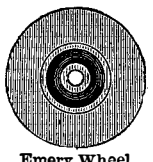

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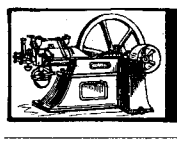

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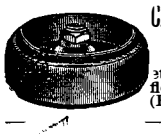

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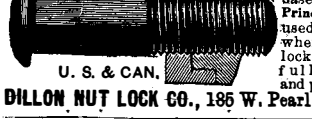

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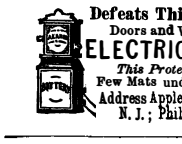

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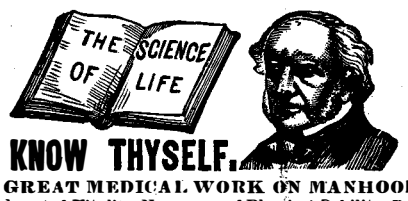

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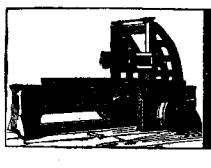

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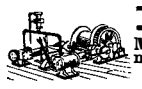

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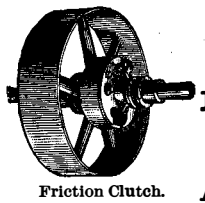

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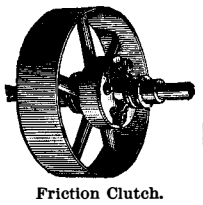

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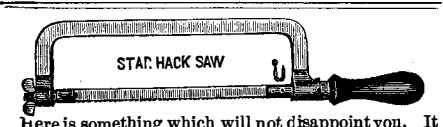

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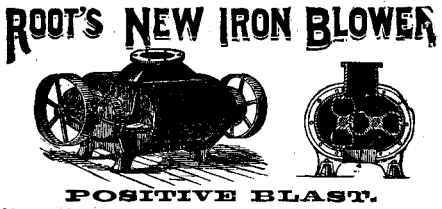

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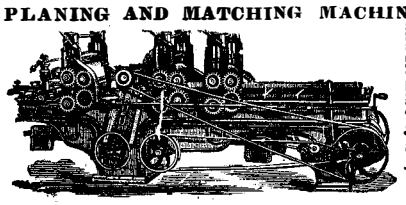

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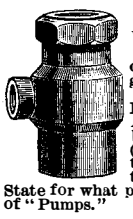

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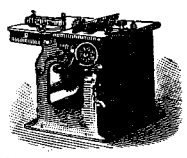

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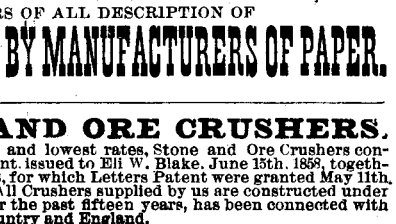

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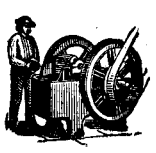

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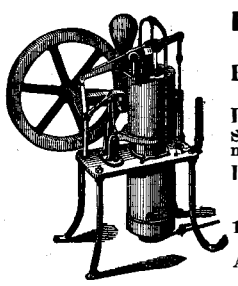

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